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I.—*Chinese Feast to Disembodied Spirits.*—By Lieutenant T. J. Newbold, *Aid-de-Camp to* Brigadier General Wilson, c. b. *Member of the Asiatic Societies of Madras and Bengal.*

The religious festivals of the Chinese are numerous, and specifically laid down by the board of religious rites in China. The sacrifices are divided into three great classes; the first and most important of which is subdivided into sacrifices offered to the azure heavens, to the earth, to the great abode of ancestors, and to the *Shay Tscih,* or gods of the land. The inferior sacrifices are offered to the planets, ghosts of great and good men, Confucius, the deities presiding over the elements, thunder, clouds, mountains, &c. Those which appear the most attractive in Chinese colonies are the *Yuen Tan,* on their new year's day; the feast of lanterns in the first moon; the sacrifices at the tombs, *Tsing-ming,* in the third moon; the feast of the dragon and *Quantai,* in the 5th moon, and that of *Shaou-e,* to the *manes* of their relations in the 7th moon.

The festival of *Shaou-e* commences on the 1st of the 7th Chinese month, and continues to its conclusion. Strictly speaking, the last fifteen days should constitute its duration. It is offered to the souls of the dead, which, during the month, are supposed by the Chinese to issue forth from the invisible world and visit their relations on earth. Supernatural noises, whisperings, and the rush of these aerial beings through the air, are pretended to be heard. It is said to have been instituted in honour of the descent of a mortal into *Hades,* who rescued his mother, as Orpheus endeavoured to rescue Eurydice, from Pluto's

drear domain. The sacrifice to the souls of the dead is of great antiquity in China. Confucius, in the *Chung yung,** or golden medium, is stated to have declared that, "the man who was free from grief was *Wan Wang*—his father *Wang-ke*—his son *Woo Wang*. His father commenced the career of virtue, and his son continued it. *Woo Wang* continued the virtuous course of *Tae, Wang Wang-ke* and *Wan Wang*. He only once buckled on his armour and he gained the empire. His personal conduct was such, that he never lost his illustrious name in the empire. As to honour, he was emperor, and in riches, he possessed all within the four seas. He sacrified to his ancestors in the ancestorial temple, and his posterity preserved the empire.

Woo Wang, was in the decline of life when he received the appointment of heaven (i. e. the empire). *Chow-kung* perfected the meritorious deeds (or wishes) of *Woo-Wang*, paid royal honours to *Tae Wang* and *Wang-ke*, and sacrificed to their ancestors, according to the rites due to the emperor. He extended these sacrificial rites to the princes, great officers of state, literati and common people. If the father held a high office and the son was one of the literati, then he was buried according to the rites of great officers, and the subsequent sacrifices were those of the literati. If the father was one of the literati and the son a great officer, then his funeral rites were such as belong to the literati, and his sacrificial rites such as belonged to a great officer.

"'Confucius exclaimed, the filial piety of *Woo Wang* and *Chow Kung* is universally talked of.' 'In the spring and autumn they put in order the ancestorial temples, arranged in proper order the vessels of sacrifice; put the clothes of their ancestors on a person to represent them and offered the sacrifices of the season. By the rites in the temple of ancestors, are separated the different generations, according to their regular succession.' 'They served the dead as they did when they were alive, and those who are buried, as when they were with them. They served the Great Supreme by the sacrifices offered to heaven and earth, and offered the sacrifices of the ancestorial hall to their ancestors.'"

We gather from what has been said above, that sacrifices to the dead were offered in China so long ago as the time of *Wang Wang*, who is supposed to have flourished about the termination of the *Shang* dynasty, about 1112 years before Christ; and that they are considered by Confucius as necessary acts of religion or filial piety. They are

* The four books, p. 14, sec. xviii.

by no means peculiar to the Chinese; the Romans, we are told by Juvenal, offered sacrifices to the manes of their ancestors. It was an ancient custom among them to bury their dead in their dwelling houses. About which their spirits were presumed to hover for the protection of the living. The following notes on the Chinese feast to the spirits of the dead, as celebrated by the colonists at Malacca, were taken on the spot. The ceremonial will probably be found not to differ materially from that observed in the Celestial Empire, as the Chinese settlers, though not at all overburthened by a sense of reverence for their national religion, are remarkably tenacious of the pageants and festivals connected with it, and are moreover excessively superstitious. The number of these settlers in Siam, Cochin China, Tonquin, the Malay Peninsula, and the Islands of the Indian Archipelago is supposed now to amount to upwards of 800,000 individuals, all males. Those in our settlements in the Straits, Penang, Malacca and Singapore, I find, from censuses in my possession, amounted in 1835-6 to not less than 28,854 individuals, who emigrate principally from the provinces of Canton and Fokien. Though contrary, I believe, to the laws of China, emigration is connived at by the government, as it rids the country of paupers, a few of whom return to spend their hardly earned savings in their native provinces, thus creating a double benefit to the state. The prohibitions touching the emigration of the females are still rigidly observed, and have partly the desired effect of bringing back to their native country many wealthy individuals. If these interdictions were abolished, there is little doubt that our colonies to the eastward would be permanently filled by this active and busy people. The Chinese, in spite of their gambling and dissipated habits, are decidedly our most valuable class of subjects in the Straits. I have witnessed their activity in almost every situation, as artizans and mechanics, as navigators, agriculturists, cultivators of spices, miners of gold and tin, as merchants and shopkeepers, and have invariably found them superior, both physically and intellectually, to the Malays, Javanese, Siamese, and natives from continental India, among whom they have to struggle for a livelihood. Without further digression on this interesting subject, I will now return to my notes on the *Shaou-e*.

Riding out on the evening of the 1st day of the 7th moon, I observed crowds of Chinese in the streets, busily engaged in burning long strips of yellow and white paper, which formed a series of blazing piles, extending nearly the whole length of the street. They set fire to them with small tapers of red wax. These form the first offerings

and are supposed to pass into the invisible world as garments, &c. for the *manes*, who on this day are permitted to emerge from the gates of their shadowy abode, and visit their relatives on earth.

On the 15th day of the moon, I visited the *Quan-yin*, or temple, where the sacrifice to the spirits of the poor, and of such as have no surviving relations, is held. The place resounded with the clang of the deep toned gong, and the deafening clash of the Chinese cymbal. Within the walled enclosure surrounding the temple, a large platform was laid out with a number of dishes bearing conical heaps of boiled rice, adorned with slips of gaily coloured paper, shewing Chinese characters. The four angles of the platform were marked by columnar fabrics, constructed of bamboo and studded all over with Malay fruits—principally the *Sintol* and *Rambútan*, (*Nephelium Echinatum*). At the bottom rose a huge pyramid of plantains crowned with small flags. Behind this grinned ghastly the boiled corses of a flayed sheep and porker. Vessels, apparently containing their frothy blood, were placed before them. Nearer the temple stood another platform, bearing a table with the seats of the three *Wey-siong* or officiating priests. The inner door of the temple was shaded by the large leafy stems of sugar-canes, decorated with scalloped paper of a bright yellow hue.

In the street, in front of the principal entrance, I observed a third platform, about twelve feet high, illuminated by large tapers of red wax, the light of which was somewhat obscured by the clouds of smoke arising from burning incense. On the platform were ranged baskets of fruit and cakes; among the latter were some shaped like the human hand, divested of three of the fingers, small packs of Chinese cards, opium, and minute cups of porcelain, containing arrack. The baskets and dishes were surmounted by little flags. A table of great length, brilliantly lighted up, and covered with a variety of dishes of Chinese *cuisine*,* sweatmeats, fruit, &c. stood in the centre of the street. This formed the banquet intended for the expected aerial guests; for each of whom was placed a small cup of tea in the Chinese fashion, without either milk or sugar; one of hot arrack, a little plate of condiments, and a pair of gilt and red *kwae-tsze*, or chop sticks.

A personage called by the Malays, *Hantu Ribut*, the storm fiend, and by the Chinese *Tye-su*; a deity whose province it is to take charge of the souls of men, and to distribute the offerings, presides over the

* The custom of offering dressed meats to the spirits of ancestors was practised by Confucius. We find in the book of *Shang-lun* that when his prince presented him with raw flesh, he had it dressed and then offered it to his deceased ancestors.

banquet. He is represented by a black hideous image placed on a white pedestal covered with a Chinese inscription in black letters. The face, like that of *Mokanna,* was veiled. The covering was subsequently removed, as will be mentioned, from a visage frightful beyond description, black, covered with whitish blotches; a mouth of fearful dimensions, out of which was thrust a large red tongue. The head was large and covered with red shaggy hair. His apparel consisted of a black and gold vest, partially concealed by the folds of a red mantle thrown over his shoulders. A lion's head, painted green and white, adorns the idol's stomach. The legs are black and appear in all their naked deformity. The right hand grasps a banner on which appeared an inscription in Chinese.

At eight o'clock in the evening, the idol was brought forth with music and lights, and placed aloft on the platform last mentioned. The priests advanced to meet it, removed the cover from its face and* bowed down before it. This done they seated themselves at the table on the platform within the enclosure. On the table were placed four large red wax lights, a ritual, two small bronze bells, a vessel of water, two sceptre-like wands, two sticks slightly curved at the end, a small red slab, a cup containing rice, several small vessels, one of ashes, a sword, a red blossom of the *Siantan,* and vases of burning incense. A little after eight, five lay-officials made their appearance; the *Lochu* and four *Tao-kis,* who are the annually elected trustees of the temple fund. They were clad in their purple robes of ceremony, their tailed heads covered by conical caps, from the apex of which flowed a profusion of a substance resembling horse hair, stained crimson. They proceeded to the middle shrine, and afterwards to one of the side ones, where they performed adoration and offered incense. Shortly after this the three priests went through the same ceremony. The chief priest was a benevolent looking old man, clothed in a long brown robe and wearing a hat, not very dissimilar from that at present in use among the dignitaries of the christian church. They then adjourned to the table where the feast was prepared, and finally resumed their seats on the platform. The ceremonies commenced by the officiating priest producing five gilt portraits of the goddess *Hootchko,* to which five adorations were

* The Chinese forms of adoration consist in what they term the *pai*, *kwei*, and *kow*, bowing, kneeling and placing the forehead on the ground. They were in this instance performed consecutively; the priest bows his head towards the image, sinks on his knees; and from this last position, inclines his body forward, supporting its weight on the palms of the hands, until his forehead touches the carpet of prayer.

made ; as also to the vessel of her ashes, and to the water, as emblematic of the water of immortality. The ritual, which I believe is termed *Nanwaking*, was now opened, and a series of prayers read aloud by the chief priest in a recitative style : the termination of each of the prayers, or certain periods in them, was marked by his striking on the table with the red slab. The two inferiors assist in the service, marking the cadences in the chants, by instruments resembling castanets. At stated intervals the chief priest changed his robes for others of a different hue,* rang the bronze bells and sprinkled water, while the large gong of the temple ever and anon pealed forth a deep and sonorous note. The service was conducted with great solemnity, and reminded me of that of the Romish church. Its object, I understood, was partly to invoke the four spirits from the north, south, east and west, and to entreat them to assist in assembling the ghosts of mortals, wandering within their shadowy precincts to partake of the banquet prepared for them, and also to invite the ghosts themselves. This done the priest casts the divining *Keaou pei*† or *Shing keaou.* Should they turn up successfully twice out of the three times they are cast, the spirits are supposed to have accepted the invitation, and to have arrived at the temple. They are visible, if we can only believe our Chinese informants, to any person of faith, who will prepare his eyes for the sight by anointing them with the blood of a black sheep.

The high priest afforded his ghostly guests ample leisure to discuss the good things set before them, by continuing the prayers till nearly midnight. He then took out the sticks of incense, burning in the censers before him; and cast them, one by one, into the open space in front of the platform. The spirits are now presumed to have taken

* "The imperial high priest, when he worships heaven, wears robes of azure colour, in allusion to the sky. When he worships the earth, his robes are yellow to represent the clay of this earthly clod. When the sun is the object, his dress is red ; and for the moon, he wears a pale white. The kings, nobles, and a centenary of official hierophants wear their court dresses. The altar on which to sacrifice to heaven is round to represent heaven ; this is expressly said. The altar on which the sacrifices to the earth are laid, is square ; whether for the same wise reason or not is not affirmed. The "prayer-boards" *Chuh-pan*, are of various colours, for the same reason as the emperor's robes. In the worship of the heavens, a yellow ground is used with black characters ; for the worship of ancestors, a white ground is required with black characters ; for the sun, a carnation with vermilion characters ; and for the moon, a white ground with black characters."—*Art. on State Religion of China—Chinese Repository*, vol. iii, page 50.

† The *Keaou-pei* used, were small reniform bits of bamboo having one side convex, with an orifice through the centre.

their departure. The names of the contributors to the feast are read aloud, and on a signal given by the priest, the spectators make a rush at the table and carry off all the dishes they can lay hands on. The pillars of rice and fruit are precipitated to the ground, and the whole material of the banquet cleared off in an incredibly short space of time, by hands infinitely less ethereal than those of spirits. Hence this feast is termed by the Malays, *Sambayang Merrabút*, the plunder ceremony. The feast concludes by the burning of the images, paper-houses and mountains, gold and silver paper which are consumed in one large blazing pile, for the use of the departed spirits in the other world. According to an article in the Indo Chinese Gleaner, (II. 360). " The burning of paper (for a religious purpose) whether gilt or plain, of whatever shape, appears to have been adopted immediately after the abolition of human sacrifices on the death of *Che-kwang* (who died about 150 years before Christ), when he caused his domestics to be put to death to attend on him in a future state.* At present the consumption of paper which is annually used on all religious occasions, is very considerable, and forms an extensive branch of trade with the Chinese. The more usual offering is a piece of paper, about a foot long and eight inches broad, in the shape of the front of a bonnet, with a small piece of gold foil on its back; besides which they have representations of men and women, with various dresses, with houses, servants, boats, boatmen, &c. which are burnt and passed into the invisible state for the use of the deceased. Many well-disposed persons in China, allow the priests a certain sum monthly to offer up prayers, and burn the paper offerings for them; and wealthy people often employ men for the sole purpose of offering incense, burning paper offerings, and letting off fireworks on their festivals." The Chinese ordinary oath, as I have witnessed it taken in our Courts of Justice, consists in the person holding in his hand a slip of yellow paper, on which is inscribed an imprecation of divine wrath on his head, should he declare what is false. The paper is set fire to and burnt while retained in the hand. It, together with the inscription, is supposed by this process to pass into the other world and be there recorded.

* The Scythians, it is said, and some of the Tartar tribes, observed this horrid custom. In China, they anciently made bundles of straw in the shape of human beings, and in the time of Confucius, images of wood, which were interred with the dead. It is to this practice that Mencius alludes in the *Shang Mung* (page 6).

Besides the ceremony, just described at the temple, the private festivals of the different fraternities or *kongsis,* into which the Chinese enrol themselves, are held on the succeeding days of the month, in different quarters of the town; conducted by their respective *Lo-chus* and *Tao-kis.* As these are regularly subscribed for by the fraternity and consecrated to the *manes* of their departed relatives, no indiscriminate sharing of the remnants are permitted; each member carrying off at its termination the dishes he contributed, or is entitled to. The *Wey-siongs* or priests, attended and offered prayers and incense, first to the *Penates** and then to the spirits, who are presumed to be

* The household gods of the Chinese are generally a triad of deified mortals depicted on a large sheet of thick paper, which is suspended to the wall of the interior of their houses. Offerings of incense are made to them every day at sun-rise and sun-set, and of tiny cups of tea at the new and full moons. The vessels of ashes used at the funerals, about which the spirits of the deceased are supposed to hover, are placed on a small table in front of the picture. The principal figure in the group is that of *Quantai,* king of the west, who is represented in the painting from Canton in my possession as a portly middle aged person, with a rubicund visage garnished by a pair of sedulously cultivated *favoris* and mustachios. A scanty black beard descends from the tip of his chin down his capacious chest. He wears a purple tiara richly embroidered with gold, surmounted by a crimson ball. A white falling collar edged with blue, is fastened with a jewel round his throat. A red vest is almost concealed by a surcoat of light green, lined with pink, which descends to the feet and is emblazoned with the truculent heads of the imperial dragon in gold. It is confined around his ample waist by a red cincture, studded with precious stones, from which depends a long crimson tassel. Emerging from the folds of the robe on the left side, appears the *opou* or purse of red, green, azure and gold. The feet are protected by red slippers made after the Chinese fashion, with thick white soles, turned up at the toes, and ornamented with green and white He is seated on a throne of a dark reddish wood, over the arm of which hangs the skin of a lion. His left hand grasps one arm of the seat while his right plays with his beard. The right shoulder is ornamented with a richly embroidered badge.

The two other personages are subordinate in the group, and preserve a standing posture. The one on *Quantai's* right is a ferocious looking black, holding the *tat* of office, a sort of poll-axe, adorned with a red tassel, and inlaid with gold. From his right depends a green hilted sword furnished with a blue sword knot. His head is covered with a pink cap embroidered in gold, green, blue and white, a large gilded badge decorates the upper part of the right arm, and a straggling black beard descends on a blue edged, white falling collar. His robe is of various colours.

The figure on *Quantai's* left is frequently omitted. His name is *Wam-poa* and he seems to be the *Mantri* or prime minister, from his bearing the bag containing the imperial signet. His features are benignant and placid; his face fair and of the true Chinese expression, affording a striking contrast to the fierce Tartar countenance of *Quantai,* and the diabolical visage of *Chuchong.* His cap is of a fanciful shape, of various colours and richly embroidered with gold. A blue sash edged with white and gold, confines a plain red robe. The length of the finger nails of *Wampoa* and *Quantai,* imply a life of ease. The bag containing the signet is of a pale yellow, bearing a Chinese inscription in letters of gold on a pink ground.

present. The chief priest was on these occasions attired in dun coloured robes; the two others in purple, and carrying small bronze bells. These feasts terminated like that at the temple by a general conflagration of the images, paper, &c. for the use of the spirits. The *Lo-chu* and *Taokis* for the next year were then chosen in the following manner. The *Lo-chu* of the past year proceeded towards the painting of the *Penates* at the end of the room, and lighted several sticks of incense; steadfastly regarding the picture, he cast the divining bamboos, one from each hand, on the carpet, and pronounced at the same time the name of one of the candidates. Should the *keaou pec* turn up successfully twice, he is chosen—if not, the *Lo-chu* proceeds to cast them in the name of the next aspirant.

On the last day of the month, the feast to the spirits of orphan children took place at the temple with great display. The sweetmeat, fruits, &c. on the table were cut into a variety of fantastic forms, scorpions, rats, dogs and centipedes. In place of the hideous *Tye-su*, god of disembodied spirits, the image of a fair and beautiful female, the tutelary goddess of children, having a halo around her head, presides. Two children are represented standing before her. She, however, is doomed to the fire, and takes charge of the paper, houses &c. for the benefit of the infant spirits in the other world. The offerings were so numerous as to form a splendid funeral pyre; and at midnight the goddess sank into the curling flames, amid the clash of cymbals, the noise of gongs and bells, and the chanting of the prayers of the priests.

In the houses of Chinese drug-venders I found the pictures of *Quantai*, &c. replaced by those of a venerable sage holding a pencil in his hand. With this pencil, which resembles that used by the Chinese for the common purposes of writing, he is said to have effected the most miraculous cures. The druggist did not scruple to tell me a story of the celestial dragon himself, leaving his starry mansion for the purpose of consulting this Chinese Esculapius, on account of a disorder in his eyes, occasioned most probably by a whisk from the tail of a comet. In the foreground of these paintings, I observed one of the sage's disciples busily employed in extracting a bone from the throat of a tiger, who had been a little too precipitate in the process of deglutition.

II.—*A brief notice of some of the Persian Poets.—By* Lieutenant T. J. Newbold, *Aide-de-Camp to* Brigadier General Wilson, c. b.

(*Continued from No.* 15, P. 237).

Lutf Uddin Nishapúri.

لطف الدين نيشابوري

Nishapúri was noted for the bad fortune which attended his whole career. *Mahomed Bukhtáwer Khan*, who relates the following anecdote of him, neither mentions the date when this poet flourished, nor gives any notice of his compositions, save a single stanza which is too much defaced, in the copy I possess, to be made out. Thus ill luck may be said to have persecuted him even beyond the dark inquisition of the tomb. But to the anecdote—" It is said that *Nishapúri* one day placed a number of pigeons, which he had taken considerable pains in collecting, together with a vessel of wine and a dish of the *pilau*, termed *mútanjen*, in a convenient spot in the garden, while he went in person to invite the object of his affections, to see the airy evolutions of the birds, and to partake of the good things he had prepared. In the interim some of his rivals scaled the garden wall, devoured the *pilau*, and washed it down with the wine. This done, they seized two of the pigeons, put them into the empty dish, and carefully replaced the cover. The poet shortly after arrived with his mistress, but on taking off the cover, was most disagreeably startled by the sudden flight of the pigeons from their *pilauless* prison. His rivals enjoyed the scene from a corner of the garden, where they had secreted themselves, while the disappointed lover cursed his unlucky stars; which, to use his biographer's words, although he was neither so great a villain as Pharaoh or Shedad, had played him so scurvy a trick."

Majid Uddin.

مجيد الدين

Flourished in the time of *Atàbek Selgur Shah*, and was an intimate friend of *Khajeh Bhài-uddin Diwan.* He had a wife, both old and a shrew, whom he was at last constrained to run away from to Ispahan. The disconsolate spouse, like the old man in Sinbad, was not so easily to be shaken off, but followed his steps to the far-famed capital of *Iran*, with a perseverance sometimes to be met with in ladies of more

modern times similarly situated. One of *Majid's* pupils hearing of her arrival, thus maliciously congratulated his preceptor—" Good news. A lady has honoured (lit. descended on) your house to-day." On which *Majid* drily remarked, " It would have been better young man, had you brought me tidings that the house had descended on her."

Selgur Shah presented him on some occasion with a very costly robe, but of not very recent manufacture, having most of the words comprised in the *Kalimeh*, the Mahomedan confession of faith, embroidered thereon in letters of gold. The part deficient was the conclusion of the creed, viz. Mahomed Rassùl Allah, محمد الرسول الله Mahomed is the ambassador of God. Some of his friends on observing this, expressed their surprise at the omission of this very important article of their faith, when *Majid* pleasantly remarked, in allusion to the robe's antiquity, that he supposed it must have been fabricated before the time of the prophet.

Malek Kúmi.

ملک کومي

This poet travelled from Persia to the court of Nizam Shah in the Deccan; after whose death he held some lucrative appointment about the person of Ibrahim Adíl Shah. His compositions are said to comprise nearly a lac of couplets of no great merit. The poet *Zahùri* espoused one of *Kúmi's* daughters.

Malek Razi Uddin.

ملک راضي الدين

Was governor of *Bakr* in the reign of *Abaka Khan;* but for some misconduct was disgraced and the post conferred on the eunuch *Jelal Uddin*, on whom he penned a severe satire. He did not omit to make sarcastic allusion to his rival's bodily defects.

Malek Shah.

ملک شاه

Son of *Takhash*, a governor of Khurassan, was a poet of considerable talent. *Bukhtáwer Khan* does not mention the era in which he flourished.

Auhadi.

اوحدي

A celebrated poet, called also *Maregah,* flourished in the 7th century of the Hejira, and died about A. H. 696 at Ispahan, during the reign of *Gazan Khan,* son of *Arjun Khan.* His tomb is in the city, and is held in great reverence. His tutor, *Shaikh Shehab Uddin,* was a man of great piety, and was accustomed to recite after evening prayer the whole of the koran. *Maregah* thus brought up did not fail to make considerable progress in metaphysical studies. His biographer thus observes in palliation of his being a poet—" Although *Maregah's* elegant and playful disposition led him to the composition of poetry, yet the graver study of the mystic tenets of the *Súfis* was what engrossed his more serious attention; so much so that he accomplished the translation of the book *Jam Jam,* the Mirror of Sufiism, in the incredibly short space of a single month." The first sixty years of his life were passed in indigence and poverty; but finally, " the sun of his fortunes emerging from the clouds of obscurity that shaded its rise, set in glorious splendour and effulgence."

Mir Khosro.

ميرخسرو

Flourished in the 14th century of the Christian era. *Khosro* is justly celebrated throughout the east for the purity and elegance of his style. He produced a *khamseh* in emulation of the celebrated composition, known under that title, of *Nizámi,* which it resembles both in subject and metre. The *Durya-i-abrar,* a mystic poem, is from *Khosro's* pen.

Mohammed Katebi.

محمد كاتبي

Or *Bin-Abdallah al Nishapúri,* was born at *Tarshiz* in Khorassan, whence he is sometimes termed *Tarshizi.* He resided at *Nishapúr* under the protection of *Sultan Mirza Ibrahim.* His works are numerous : among them is a poem on the loves of *Bahram* and the fair *Gùlandám*—the *Kitab-i-Husn-wa Ishk*—the *Deh Báb*—the *Nasir-i-Mansùr*—the *Majina al Bahrain* and a *Medah* in praise of the Sultan, every verse of which terminates with the word *Gùl*—a rose. *Katebi,* while

reciting this ode was interrupted by the *Sultan's* suddenly demanding from him whence he came. The poet without the slightest hesitation replied to the monarch in the same metre in which he was then reciting,

همچو عطار از گلستان نشا پورم ولے

خار صحرائے نشاپورم من و عطار گل

"Like *attar,* I come from the rose garden of Mishapùr,

But I am as a thorn of the desert,while *attar* is fragrant as the rose."

Katebi received ten thousand *dinars* for the ode. He bestowed the sum on the poor and indigent. The date of his death may be ascertained by the numerical value of the letters composing the following hemistich, viz. A. H. 886:

مصرع

نماند کاتبی وماند ذکر او بجهان

Kàtebi remained not, but his name is everlasting in the world.

He is said to have been styled *Katebi* from the beauty of his handwriting. His *khamseh* is on the model of that of the celebrated *Nizami* (2 vol.).

Mohammed Shems-uddin Sózni

محمد شمس الدين سوزني

More familiarly called *Hukkim Sozni,* was descended from *Suliman Farsí,* one of the first companions of the prophet. Some writers aver that he was born at *Sámarcand,*—others, at *Nakshet,* and that having completed his studies at *Bokhàra,* he settled at *Samarcand,* where he died, aged 80 years, A. H. 569; according to *Mahommed Bukhtawar Khan* A. H. 566. *Sózni* was of a lively and agreeable turn of mind, and on this account his society was much sought after by the young and convivial. In their parties he gave free vent to those sallies of wit, for which he is so justly celebrated, and which sparkled in various impromptu repartees, both in prose and verse. He was a needle-maker, as his surname *Sózni* imports, and adopted this

handicraft in order to obtain easier access to a damsel, of whom he became passionately enamoured, under pretence of disposing of his needles. Towards the close of his career he retired from the world, in order to devote himself exclusively to the study of theology under the spiritual guidance of *Senai*, and other celebrated teachers. He commenced by performing the pilgrimage to Mecca, which his history tells us was accomplished after the most approved and orthodox fashion. In the subsequent penitentiary exercises he manifested great severity and self denial, and alludes to his sufferings in a *Diwan* comprizing 8,000 verses, wherein all that is touching and pathetic in Persian poesy has been employed to paint the anguish and remorse he felt for his sins. It is said that he appeared after death to one of his friends, and informed him that the Almighty's pardon had been extended to him, on account of the following lines, composed in the highest fervour of devotion:

قطعه

با دشاها من بدرگاهت پناه آورده ام
سرزراهت برده بودم رو برو آورده ام
چار چیز آورده ام شاها که درگنج تو نیست
نیستي و حاجت وجرم وگناه آورده ام

I have brought into thy presence, oh God! four things that are not in thy treasury, viz.—nothingness, poverty, sin and repentance.

Ruchi, a disciple of *Sózni*, wrote a quatrain on the occasion of his master's death, wherein he observes, in allusion to his surname *Sózni*, "every hair of my eyelids has become piercing as a needle to my eyes, since I can see him *(Sózni)* no longer; and every hair of my body as a thorn in my flesh, in that he is lost to me. Heaven now has nought for me, save the demonstration of its wrath."

One day the poet *Fazli* found *Sózni* in an assembly of literary men, with a face much inflamed in consequence of a controversy he had entered into with one of his friends. *Fazli* enquired with some astonishment what was the reason of so great an alteration in his looks; *Sózni*, moved by the brusque manner in which the question was put, retorted on his interrogator, who happened to possess a countenance the very reverse of beautiful, "The moment I saw you, my sins came

into remembrance and I blushed through very shame." *Fazli* replied, "Why should the sight of me bring your crimes to mind?" *Sózni* rejoined, "I feared lest God as a punishment for them might make me as hideous as you are."

Jeláli, another poet gifted with a nose of surprizing length complained one day to *Sózni* of his having conferred on him the *soubriquet,* "*Kher-i-serkhom-khaneh*"—the ass of the wine cellar; but added that he was not at all vindictive and knew how to bear insults without resentment. *Sózni* pleasantly replied that this patient disposition of his was sufficiently manifest to all the world, seeing that he had borne for 40 years a nose so long and incommodious. Herbelot cites an epigram on this subject written by *Sózni* to the following effect: "Thy immeasurably long nose is a burthen to every one, for it is thrust every where without the slightest discretion. I am well convinced that when thou prostratest thyself it is less for the purpose of devotion, than to disencumber thyself of the weight of a burden alike insupportable to its possessor and to others."

The author of the *Tarikh-i-Guzideh* observes that *Sozni* was also called *Abu Bekr al Beláli,* and dwelt at *Kilas,* a dependancy of Samarcand. *Mahomed Bukhtawer Khan* states that he obtained the appellation of *Sozni* from his affection for the son of a needlemaker. He cites the following couplet as the *Matla** of the ode in which *Sózni* craves divine mercy.

بیت

تاکی زگردش فلک آبگینه رنگ

برآ بگینه خانهٔ طاعت زنیم سنگ

"How long through the revolution of the mirror-like heavens shall we continue to cast stones on the crystal mansion of self restraint!" The date of his death is A. H. 566 as appears from the numerical value of the letters composing the following words calculated agreeably to the *Abjad.*

سوزني فحاش دم

* For the explanation of *Matla,* vide Essay on the metrical compositions of the Persians (Journal No. 14, p. 116).

Moulana Maruf.

مولانا معروف

Cotemporary with *Secunder Mirza*, governor of Shiraz, in whose presence he composed and wrote down, between sunrise and afternoon prayer, one thousand five hundred distiches, for which he was munificently rewarded by the *Mirza*. *Maruf* was remarkable for generosity and his beautiful penmanship.

Muazzi.

موزي

A poet in the service of *Muaz-uddin Malek Shah ;* hence his appellation. *Muazzi* had an excellent memory, and could repeat an ode of considerable length after having heard it only once recited.

Mustoufi Ahadi.

مستوفي احدي

Ahadi was born of a good family in the town of *Sabzwar* in Khorassan. Among his compositions is a *Medah*, in praise of *Imam Ali Bin Mússa-ar-Reza*. He possessed considerable knowledge in physic and astronomy.

Najib Uddin.

نجيب الدين

Was the encomiast of *Kila Wesak*. He died towards the conclusion of the Seljukian dynasty and is better known under the title of *Jer Badkani.*

Najm Uddin.

نجم الدين

Flourished during the reigns of *Abaka Khan* and *Arjum Khan* his son. He followed the trade of a goldbeater and was accounted a good poet. The following lines are cited by his Persian biographer as a specimen of his style :

نظـــم

منم زرکوب محصولم بصنعت

بجز فریادے و بانگم نبا شد

همیشه در میان زر نشینم

ولیکن هرگزم دانگی نباشد

I am a goldbeater, and earn my bread by my trade;
But cannot get on without clamour and noise,
Though always seated in the midst of gold
I have not a *dank** to call my own.

Màmi Mir Mahomed Màsum.

نامي مير محمد معصوم

This poet was a noble of *Bekr* and one of *Akbar's* courtiers. He was sent on an embassy to Persia, and on the journey amused himself by cutting verses of his own composition on the pillars and mosques where he halted. The following lines of his are cited:

بيـــت

چون گریهٔ من دید نهان کرد تبسم

پید است کین گریهٔ من بي اثر نسیت

"When she saw my tears, her smiles vanished, and it became evident that my weeping was not lost upon her."

Nàsiri Hamdàni.

ناصري همداني

Hamdàni, lived in the reign of *Jehangir*, and is said to have excelled all his cotemporaries in beauty and melody of language. He com-

* The *dank* is a small coin valued at the sixth part of a *direm*.

posed a *Diwan* considered as the "model of eloquence." He shone also in epistolary composition.

Nàsir Khosro.

ناصرخسرو

A poet, physician by profession, cotemporary with *Sultan Mostanser Fatimi Mughrebi*, caliph of Egypt, flourished in the 5th century of the Hejira—*Khosro* was profoundly read in the doctrines of the *Shías* and his opinions on religious subjects were implicitly bowed to by those of his own sect. His poetical compositions are but faintly praised. The name of one alone is mentioned by his biographer, viz. the *Roshnai námeh.*

Náziri Nishapúri.

ناظري نيشاپوري

Nishapúri was liberally patronized by the emperors *Akbar* and *Jehangir*. He was more lauded for his generosity to mendicants and faquirs than for poetical talent.

Newái.

نوائي

Also called *Mir Alishir*, is the author of a *Diwan* written in the Persian and Turkish languages. He composed an ode in answer to the *Bahr-al-abrar* of *Mir Khosro*. *Newái* was a man of wealth, famed for generosity and his munificent patronage of poets and men of letters.

Nevidi Nishapúri.

نويدي نيشا پو ري

This poet was a native of *Nishapúr* as his title imports. He entered into the service of the emperors *Humaiyún* and *Akbar*, in praise of whom he composed numerous *medahs*. He died A. H. 973 and was interred at the city of *Ajin*.

Nezári Kohistan.

نظاري كوهستان

Kohistan excelled in compositions on wine, in its mystic signification. He lived in the reign of *Akbar.*

Nizámi Wrózi.

نظامي عروضي

Namesake and contemporary of the celebrated *Nizámi,* author of the *Majma-un-nuwádir,* collection of wonders. The *Sultan Toghral* one day asked *Wr ózi* whether there was not another poet named *Nizámi.* He answered that there was, and in an extempore stanza confessed his own inferiority.

Nizámi.

نظامي

Or *Sheikh Nizámi Gangiah,* a celebrated poet, lived during the reign of *Sultan Toghral Bin Arselan Seljùki,*in the 6th century of the Hejira. He was the author of five very justly celebrated poems, entitled, collectively, the *Khamseh,* from the Arabic word *Khams* خمس five ; in imitation of which those eminent poets, *Mir Khosro, Hátifi, Kátebi* and *Jámi* composed theirs.

Of these the *Makhzen-al-asrar* is a poem on ethics and the doctrines of the *Súfis.* The *Shírín-wa-khosro,* the *Leila wa majnún,* the *Herft Paiker,* are all love tales well known in Persian poesy. The fifth and last is the *Secunder* or *Sheref Nameh,* the history of Alexander the Great, a poem of great merit. It commences with the narration of his birth and education under *Nikermas,* father of *Aristo,* or Aristotle, and goes on to relate in successive chapters his victories over the armies of *Rúss* and *Zangbar* (an island supposed to be in the Indian seas)—the construction of his famous mirror—his victory over the Persians under *Dára,* Darius, and the death of that monarch—the destruction of the temples of the Magi or fire-worshippers—his visit to the *Kaabah,* and to the cave of *Kai-khosro;* who, according to Sir William Jones was the Cyrus the Great of the Greeks—his expedition to India and China—his subsequent wars with the armies of Rúss; and

finally his travel to *Zulmet* (a dark region at the extremity of the world where the fountain of life is supposed to exist) in quest of the water of immortality, from which he returns without success.

Part the second is called the *Fal Námeh* and is probably the same, alluded to by Mr. Ousely, as the "sixth poem," sometimes added to the "five treasures of *Nizami*." It contains an explanation of the title usually applied to Alexander by Oriental historians of *Zu-al-karnein*, Lord of the two horns—the story of Arasmandas of the *Kibti*, or Coptish woman &c., the coronation of Alexander, his question to *Aflatun* or Plato. The council of the seven sages, viz. *Aristo, Wales, Balinas, Socrat, Furfuriùs, Hermas, Aflatun.* Their opinions and those of Alexander and *Nizami.*

Alexander imagines himself a prophet, and receives letters from *Aristo, Aflatún* and *Socrat.* He proceeds to the west of the land and arrives at the city of *Peristan*, fairy land. His second expedition to India and China; he falls sick on his return, makes his will, and writes to his mother and dies, succeeded by his son *Askanderùs* supposed to be the Aridœus of the Greeks.* The work terminates with a brief account of the demise of the seven sages and of Nizami. *Nizámi* describes the auspicious aspect of the planets, as observed at Alexander's birth by the astrologers, as follows. Sol emerging from Aries (*Hamal*). Mercury, *Wtárid*, from Gemini (*Jonza*). Luna and Venus in Taurus (*Sawr*). Jupiter in Sagittarius (*Kaws*). Saturn in Libra (*Terazu*). Bahram or Mars, in the sixth mansion. *Asad* or Leo predominant.

In the second part of the *Secunder Nameh* we find the following traditions regarding the origin of the title of *Zu-al-karnein* ذوالقرنين or Lord of the two horns, bestowed by Oriental writers on the Macedonian monarch. First, because the horns had reference to the eastern and western worlds of which Alexander was supposed to be the conqueror. Secondly, because he is represented to have worn two peculiar ringlets on the back part of the head. Thirdly, because he smote the talisman of *Jemshid* with a sword having two blades like the famous weapon of Ali called *Zu-al Fakar* ذوالفقار. Fourthly, because he saw in a dream the *karan-i-falek* enclosed in the rays of the sun. Fifthly, because his age (at

* Aridœus, according to Justin and Diodorus Siculus, was an illegitimate son of Philip, who succeeded to the throne on the death of Alexander. After a reign of seven years he was cruelly put to death, together with his wife Eurydice, by Olympia mother of Alexander.

..e time of his coronation) amounted to two *karans* or decades. Sixthly, when Alexander was at the point of death his likeness was taken by some of his friends who added two horns, by which were typified his two guardian angels ; these according to *Abu'l Masher* were subsequently mistaken for real horns. *Nizàmi* concludes his explanations with a story of Alexander having very long ears, which he concealed for a long time from the world, but the secret was discovered by an unlucky barber, who unable to retain it, breathed forth the fact of Alexander's deformity into a cavern. The story closely resembles that of Midas, and has evidently a common origin with that of the Phrygian king.

M. Antoine Galand, in his " Paroles remarquables des Orientaux," is of opinion, that eastern writers have conferred this title on him, from the circumstance of some Grecian coins of Lysimachus (particularly those of silver, on which Lysimachus is represented with horns) falling into their hands, which they have mistaken for those of Alexander. Their error, he goes on to say, arose from their not being able to decipher the Greek inscriptions, and from the coins being larger and more elegant than those of Alexander.

Of all the reasons just mentioned, I am inclined to think with D'Herbelot, that the first is nearest the truth ; and that the horns have reference to the power and dominion of Alexander, though not in so extended a sense as the French savant and Persian historians would have us to believe. It seems to me highly probable that by the title of " The lord of the two horns," is signified his having been the conqueror of Media and Persia, the sovereigns of which mighty empires are typified in the vision of the prophet Daniel, as the ram with two horns.* M. Galand has not favoured us with any authority for his singular hypothesis.

Nizámi, as previously styled, flourished in the reign of *Thogrul Ben*

* " An he-goat came from the west on the face of the whole earth, and touched not the ground, and the goat had a notable horn between his eyes. And he came to the ram that had two horns which I had seen standing before the river, and ran unto him in the fury of his power. And I saw him come close unto the ram, and he was moved with choler against him and smote the ram and brake his two horns."

" The ram which thou sawest having two horns are the kings of Media and Persia. And the rough goat is the king of Grecia : and the great horn that is between his eyes is the first king." (Daniel chap. viii. verses 5, 6, 7, 20 and 21).

Arslan, the last sultan of the Seljukian dynasty, who reigned in Irak Persia ; and died in the 64th year of his age, shortly after completing the *Khamseh,* A. H. 592. On his death bed he assembled his friends and exhorted them to walk in the paths of piety, and to hold fast the sacred truths of the koran. This done, he smiled and exclaimed—Oh dispenser of mercy ! keep me steadfast in the hope of pardon, and preserve me from eternal punishment in admitting me to the joys of paradise. Whilst thus speaking the sleep of death came upon him, so calmly, so softly, that one would have supposed he was still awake.

Nizámi's Makhzen al Asrar is composed in the measure, or *Bahr, Mútawi Moukuf Sarí.*—The *Shirin-wa-khosro* in the measure, *Hazaj Makhzúf Musaddas.* The *Leila wa Majnun* in the measure, *Hazaj Akhzab Makbùz Makhzùf Musaddas.* The *Heft Paiker,* in the measure, *Khafif Muktu,* and the *Secunder Nàmeh* in the measure, *Mutakàrib Maksur Musamman.* I shall conclude the notice of the contents of the *Secunder Nameh* with a few cursory observations on the Oriental and Grecian accounts of the parentage, &c. of Alexander.

Alexander of Macedon سکندر ذوالقرنین is a monarch, even more celebrated in Oriental history, than in the classic annals of Greece and Rome. The accounts regarding his parentage and birth in both are various and conflicting. Some Persian writers contend that he was the son of *Darab,* sometimes confounded with Darius Nothus, by a daughter of *Filikùs* or Philip of Macedonia; and half-brother of *Dara,* Darius Codomanus. This princess is said to have been repudiated, when pregnant by Darius, and sent back to the court of her father, where the birth of her infant, Alexander, took place. Philip brought up and educated him as his own son. Others affirm that Philip, while engaged in the pleasures of the chace, found the corpse of a beautiful woman in the forest, with a newly-born infant by her side: Philip moved by compassion ordered the funeral rites to be performed over the remains of the unfortunate parent, and adopted the infant, the future conqueror of the world, as his own. According to *Abu-l-faraz, Said,* and *Yusuf Bin Gorion,* quoted by M. Claude-Visdelon, Alexander was the son of Olympia, the consort of Philip, by *Nectanele,* king of Egypt; who having been expelled from his throne by Artaxerxes Ochus, fled in the disguise of an astrologer, and took refuge in Macedonia.

Nizàmi alludes to the two first of these traditions, and states them to be unworthy of credit. He then proceeds to tell us that Alexander, *Secunder,* was the son of *Filikùs,* a celebrated monarch, whose sway

extended over the regions of * *Rùm* and † *Rùss*, and whose place of abode was in Macedon and *Yúnán*, Greece. The name of his mother does not appear; but *Nizàmi* describes her as a lady of Philip's court of surpassing beauty and majestic stature.

* Under the term *Rùm* روم, Greece, Rome, Romelia, Turkey and even the whole of Europe, have been comprehended by Oriental writers. It is, however, generally understood to be the name given by the Arabians to the country in Asia Minor, subdued by the Greek and Roman emperors, and subsequently by the Turks, which is conjectured to have derived its name from *Rùm*, one of the sons of Esau. Subjoined is the excellent description of D'Herbelot:

Art. *Roum.* " C'est le nom que les Arabes, et autres Orientaux, ont donnè aux pays et aux peuples que les Romains, et ensuite les Grecs et les Turcs ont soumis à leur obeissance.

" Il faut pourtant distinguer les deux significations que ce mot peut avoir. Car, outre cette generale, de la quelle on vient de parler, Ebu Al Ouardi dans sa Géographie intitulée, Kheridat Alágiaib, en donne une particulière. Car il dit que le pays de Roum commence à l'ocean Atlantique, ou occidental, et comprend, le pays de Gialaleca, la Galice, Andalous, L' Espagne, Afrangiah, la Franҫe, Roumiah l' Italie, Nemsiah, l' Allemagne, Leh, et Tcheh, la Pologne, et la Boheme, Inkitay, l' Angleterre, Magiar, la Hongrie, jusqú à Constantinople, et au Pont Euxin, par où il joint le pays des secalebah, ou, slaves, et esclavons qui confinent avec les Russes, ou Moscovites. Et enfin, le pays dit encore plus proprement, Roum, Romaniah, et Roumiliah, qui est la Thrace, et la Grece d' aujourd'hui.

" L' auteur du, Massahat Alardh, l' etendüe de la terre, écrit dans le second traité de sa géographie, que le pays de Roum, dans lequel il comprend seulement une partie de l' Asie Mineure, a à son occident, Khalig 'Al Constantinè, le canal de la mer Noire, à son midy, Belad Scham, et Belad Gezirah, qui sont la Syrie, la Mesopotamie, Arminiah, ou l' Armenie, au Levant et au Septentrion, Belad Kurg, qui est la Georgie, et Bahr Bontos, le Pont Euxin ; et qù au milieu de ce pays de Roum, est Gebal Carman, la Montagne de Caramanie, c. a. Le Mont Taurus, où habitent plusieurs familles Turques, et Turcomanes, dont la chaîne s' etend depuis Tharsous, qui est Tharse en Cilicie, jusqù à l' Hellespont. Et c'est dans ce pays de Roum trés proprement dit, que regnoient les Sultans de la dynastie des Selgiucides, appelez par les Arabes, Selagekah Roum, les Selgiucides de Roum, et d' où les Turcs Ottoman qui regnent aujourd'hui à Constantinople, ont pris leur origine, ce qui fait que les Persans et les Mogols aux Indes appellent les Turcs encore aujourd'hui, Roumi.

" Les auteurs Musulmans disent, que Roum, qui a donnè le nom a ce pays là, etoit un des enfans d' A'is, qui est Esaü, ou, Edom, ce qui fait dire à Hamdi Tchelebi dans son histoire de Joseph et de Zulikha, écrite en Turc, que Dieu donna plusieurs enfans à Esaü, et qu' il y en eut un d' entre eux, hommé, Roum, qui a donné son nom a tous les Roumilar, c. a. à tous les Grecs et Romains, et que les Princes Souverains de ces nations ont porté le titre de, Caiasserah, c. a. de Cesars."

† *Rùss* روس signifies Russia ; according to Richardson, so termed traditionally after *Rùss*, the eighth son of Japhet. It is here supposed to indicate the countries immediately to the N. W. of Persia.

Such are the statements of the Persian writers. We will now turn to those of the Greeks, by many of whom Alexander is said to have been the offspring of Olympia by an enormous dragon, while others give out that he was her son by Jupiter. M. Visdelon informs us, on what authority I know not, that he was the son of this lady by a Persian *Magi* named *Nestabánus.* "Ce qui peut être vrai en cela, est que suivant le rapport de quelque Historien Grec, *Nestabánus,* Persan de nation, et Mage de Religion, vit Olympius. Ce seigneur l'etoit venu trouver, la foudre á la main, et dans tout l'equipage de Jupiter ; soit que ce fut une veritable fraude, ou une pure collusion de la Dame. Se même auteur ajoûte qú Olympius avoua la chose á Philippe." It is well known that Alexander himself instigated by personal vanity, or rather perhaps for political purposes, encouraged the report, spread abroad by flatterers, of his divine origin. After the conquest of Darius, he caused himself to be worshipped as a god and led his army over the scorching sands of Lybia, to the oracular temple of Jupiter Ammon, there to be saluted by its sycophantic priests as the son of Jupiter.

These statements it will be allowed are equally contradictory with those of Persia. Mr. Ousely in a note to his Epitome of the Ancient History of Persia (p. 26) remarks, "It is not surprising that the Persian traditions on the life of Alexander should be vague and discordant, since the Greek historians acknowledge the obscurity of this subject." "Of Alexander" (says Arrian, Proem :) "various persons have recorded various things ; nor is there any one of whose history there have been more writers, or writers more disagreeing one with another."

The opinion of *Nizami,* from whatever source derived, and of those Grecian authors who suppose Alexander to be the son of Philip by Olympia, appears to have the best foundation. For it would be absurd to imagine that Philip would prefer a nameless foundling to his own offspring, or that the Macedonians would accept him rather than a prince of the blood royal as their sovereign.

The early Persian historians, who inform us that Alexander was the son of Darius, were, no doubt, influenced to do this both by a feeling of national vanity which would not allow of their admitting the subjection of the great Persian empire by a foreign prince, and through a desire of ranking among their own hereditary sovereigns, a monarch whose

deeds of arms and character for wisdom had been noised over the whole habitable world. The idle tale of his being the son of a dragon or of Jupiter is not worth while alluding to.

Mr. Richardson in his learned dissertation on the languages, literature and manners of Eastern nations (p. xiv) asserts that the Persian version of the history of Alexander corresponds with that of Greece and Rome, in nothing but the catastrophe, the death of Darius. Although it must be confessed that there does exist a great difference in the shading and filling up of the minor details of the two portraits, still there appears to me a striking resemblance in the outline and more prominent features. For instance, both Persian and Grecian writers agree in the mystery attending his birth—that auspicious omens attended it—that he was educated at the court of Philip with or by Aristotle—also in the age at which he was crowned, viz. two *karans* or decades—Alexander's imagining himself a prophet is probably a Mahomedan version of his aspiring to divine honours—in his expedition to Egypt—the Persian conquest—the circumstances attending the death of Darius—Alexander's espousal of the daughter of Darius, Roxana, or, according to the Persians, Roshana—his two expeditions to India—the visit paid him by the Amazonian queen Thalestris, as related by Q. Curtius (the *Noshábah* of the Persians), and the duration of his reign. The Persians fix the exact site of the place of his death at Zour, the Greeks at Babylon; both cities, however, are in Assyria.

According to D'Herbelot, *Abùlfaraz* fixes the duration of Alexander's reign at 12 years; the author of the *Tárikhi-Jehán-árâ* at 14 years. This first nearly agrees with the calculation of Petavius, according to whom, Alexander

Was born ....356 A. C.....Archon Elpines.
Philip died..................336 A. C....Archon Pythodorus.
11th year of Alexander.......326 A. C....Archon Anticles.
Alexander died July 29....324 A. C....Archon Hegesias.

He was the last of the 2d or Kaianian dynasty of Persia.

III.—*Memoir Descriptive of the Vurragherry and Kunnundaven Mountains.—By the late Captain* B. S. Ward, *of the Surveyor General's Department.*

Situation and extent.—These lofty regions lie to the west of Dindigul, south of the famous temple of Pulney, and north of Perreakolum in the valley; their length from east to west is fifty-four miles, and their medium breadth fifteen miles, and their superficial area 798½ square miles (a very small portion of which, estimated at fifteen square miles, is under cultivation); the whole forming a confused mass of lofty ridges, intersected by deep valleys and ravines. The central parts, almost divested of wood, are plains, covered with a short stunted grass, the exterior ridges sloping down towards the low country, and the valleys they form are covered with high forest, more luxuriant and affording a greater variety of timber the nearer they approach the open country. These aerial regions are designated by the natives who reside on them, Keel and Mail-mullay (this may signify high and low), but more properly is a distinction of eastern and western mountains; those to the west rise to a very great elevation, some of the most conspicuous eminences being between six and seven thousand feet above the level of the surrounding plain, and fall excessively steep on the south, presenting at their summit a perfect wall of granite; to the north and east sloping down in extensive broken ridges, towards the open country; to the west falling gently and forming the valley of Unjeenad; and from it again to the south and west they rise abruptly into lofty mountains towards Travancore and Coimbatore. The cites of the villages on them are pretty nearly on the same elevation, and may be about 4000 feet above the open country. The inhabitants of these regions, are chiefly composed of the *Kunnuver* and *Karakat Vellaler* castes, and the population amounts to near 4000 individuals of both sexes.

Towns and Villages.—On that portion of the mountains to the east, denominated Keelmullay, and seen from the rock of Dindigul, the villages of note are Poolatoor, Tondygoody, Munnalur, Punnymullay, Patchelur, Perryur and Kowinjee; these have all a number of hamlets, lying promiscuously on the slopes of the valleys, amidst dry grain cultivation and plantain groves. On the sides of the streams, are narrow tracts formed in terraced beds, on which paddy is cultivated, irrigated by artificial canals; they also rear some wheat and garlic in the vicinity of the western villages of this tract. This division of the hills has a very fair proportion of forest, with groves scattered in the neigh-

bourhood of the villages, among them the jack, mango, orange, sago palm, and other trees, are spontaneous. The houses are in irregular clusters, built of mud and thatched. On the approaches to some of the larger villages are the remains of barriers, or gate-ways, as at Punnymullay, on a lofty ridge commanding an extensive view of the country towards Dindigul. Vilputty, Poomburra, Munnamanoor, with their subordinates, occupy the highest and central part of these mountains, and are all of them of some magnitude, having a large population. They are pleasantly situated on romantic projecting brows, commanding extensive views of the surrounding valleys and mountains. The houses are divided by regular paved lanes, and a principal street generally passes down the middle, with, at either end, a gateway, or barrier. The slopes in their vicinity are beautifully diversified with terraced fields on different levels, in which is cultivated garlic, mustard, tennay *(Pannicum Italicum)*; also wheat, and a species of grain similar to oats, by the natives called tovaray.* In lower valleys the rice fields gradually rise in a succession of terraces almost to the very summits of the ridges, irrigated from above by a succession of artificial canals, ingeniously conducted along the slopes, from dams thrown across often distant rivulets. Marshes are met with in low situations, where drainage is prevented by ridges crossing the valleys. In some of these, on the more elevated parts, the *wussumbu*, or sweet flag root, is obtained. This portion of the mountains, is divested of wood, a few groves in the ramifications, and some solitary trees on the slopes, being all that is to be seen. The jack, mango, and other useful trees, growing in profusion in the eastern portion, are unknown here, and fuel is now generally brought from some distant grove. The houses, built of stone and mud, and well thatched, are spacious, and, though low, are comfortable. They have each a fire-place, and sheds attached for their cattle. There are a few pagodas in sequestered situations at all these places; the only one of note, dedicated to Vailapúr or Subramunny, is at Poomburra. It is built of stone, has a respectable spire, and is highly venerated. An annual festival takes place here, when the car is decorated and drawn down the streets; the other temples are all inferior buildings and generally thatched.

The western portion of these hills, called *Mailmullay*, but better known by the appellation of *Kunnundaven*, is now a dependency of Travancore. Its superficial area is 231½ square miles, of which three square

* Barley.—R. W.

miles only are under cultivation. The north portion is studded with the villages of *Unjeenad*, a few being extensive, as *Khandel*, *Keelandur* and *Poottur*, and most of them beautifully situated on a table land. Nachyvile, though the capital, consists of only a few straggling houses, belonging to the *munnadies* or chiefs. It is situated in a low open valley, on the left bank of the Ambrawutty river, which meanders down the centre in its course north ; and to the N. W. of it is Murraoor, a large village on a slope of the hills, with extensive cultivation of rice about it. The slopes of a table east of Nachyvile, hemmed in by black rocks to the north and west, on which is the village of Kharœ, are also extensively cultivated. Here they also grow some dry grain in small quantity. About the villages on the upper table, garlic and sugar-cane thrive. The cultivation of the latter is at present confined. Wuttawaddy, composed of two hamlets, occupied by about 15 Kunnuver families, may be mentioned for its situation in a narrow and deep valley, secluded from the sun's rays for four hours in the day, a circumstance which will give some idea of the elevation of the hills about it. At this place is some flat rice land, and the hamlets are situated on low but commanding eminences on either side. The pagoda of Teneashy on the left bank of the Ambrawutty near Nachyvile, is held in veneration, and is the only building of note in this tract. Here and there, on the black rocky ridges in the valley, are many of those antiquated small buildings, known by the designation of Pandy Coolys, some of them perfect ; it is impossible to obtain any correct account of their origin.

Rivers, &c.—On these mountains are the sources of upwards of thirty large streams, which uniting, form eleven respectable rivers, the larger portion pouring down in a succession of falls into the plain country to the N. E. and S. E. Those of note in the eastern portion are the Jyempolliam river, having its sources in the chain of the Arunganul hills. It flows by Tondygoody, where it receives the name of Perryar, it then winds S. by E., and rushing down the mountains at the head of the Iyempolliam valley, is joined by the Shutar stream ; passing by Punnacad, it now winds E. by S. in a deep forest to the hamlet of Shadamoopenputty. It passes through an open valley, the banks low, and bed sandy, where it is fringed with some cocoa-nut and mango groves near Iyempolliam. Here a dam crosses it ; thence it runs S. S. E winding much, with steep banks, through dry cultivation to Tyencotta and Vadiputty. It crosses the high roads N. E. and E.

of Batlagoonta, and passing Dodiankota, joins the Vigay river, having run a course of twenty-two and a half miles from its source.

The Oomayar, rising in the Boothamulla hills, after fertilizing the table-land of Pauchelur, is joined four miles from its source, by the Kullar, a small stream from the Vaulrungatty hill. Thence, by the name of the Kodavenar, it flows S. E. three and a half miles ; E. by N. two miles, through a narrow wooded valley ; is joined by the Kolluparae stream running S. into it, from the table-land of Perryar ; then flows in a winding course easterly, obstructed by rocks, and precipitates itself down the mountains to the N. E. of Munnaloor ; thence, skirting the hills a short distance through a deep forest, it enters the plains, and joined by a large rivulet from the Audaloor hill four miles W. of Ahtoor, winds past the above place.

The Maunkurray, a small river, has its source in the northern summits of the Audaloor and Punnymullay mountains, winds down a wooded and confined very rocky valley, till it approaches the plains of Godulabavy. In its course through the flat country it has many inflections ; a rich soil is formed along its banks, and eight miles from its source crosses the road towards Pulney, east of Godulabavy, previous to which a portion of its water is turned south into the Thetthumpully tank ; thence it flows east.

The Nankasi or Nangangy river has its principal source in the Putchamullay hills, four miles S. E. of Veerupatchy, and descends to the west of it by the appellation of the Vaykalar, and being joined by the Perenkairymulla, issuing from the Perryar range of hills, slides down the N. W. face through a narrow wooded valley, fringed with teak and bamboos ; shifts for a short distance northerly, occasioned by the junction of a large rivulet from Patchelur, and winding through a flat expanse of forest to Purpul, a desolated hamlet, receiving in its course the Kunnanur and Vuddacad streams, precipitates itself down the hills to the lower table-land of Kotahvully, in a perpendicular cataract of 150 feet, into a basin worked in the rock by the force of its waters ; escaping from which, it slides down a flat rocky bed, confined by precipices to one and a half furlong (where an artificial canal is conveyed from it), continues its course over a rocky bed, again precipitating itself to the base of the hills, half a mile from the above fall. These cataracts are called the *mail* and *keel tullacooth*. In the vicinage of the lower one, a romantic spot, is an ancient temple of Neelamulla Allaghercoil, held in veneration, and of high celebrity in times past. The Nankasi then flows north, passes west

of the ruins of Veeruputchy, and crosses the high road a mile and three quarters from the lower fall.

The Autucul river issues from the summit of the Aurunganul hill, descends abruptly down its slopes, and fertilizes for three miles the narrow vale of Perrumpullum, winds N. W. one mile and a half, and west one mile and a half through a narrow and deep valley, pours down in a series of cataracts, and, turning S. S. W. one mile and a half, receives the Kowinjee stream. The latter having run a course N. by E. six miles from its sources in the Permal range, is now called the Vurdaputnum river, winds N. W. three and a quarter miles to a dam constructed across it, the channel from it winding north runs towards Ayagoody. About two furlongs below the dam, a small branch goes off and is conveyed into a tank south of the above place; the river now splits in two, unites again about a mile below, and half a mile further on has a strong dam across it. The canal conveyed away on the right bank flows south of the hill of Pulney, and ultimately discharges itself into the large tank west of the temple. The river now assumes the name of the Wurretar, and, running a devious course of four and a half miles N. W. by W. through an open tract, discharges itself into the Palar, one and a half mile W. S. W. of the temple of Pulney, having run a serpentine course of seventeen miles from its furthest source.

The Palar rises in the open slopes in the Kullerungavvay hills, and only a short distance from the southern summit of these mountains. It flows in a small stream to the east, north of Shumbaganur, and N. E. five miles from the source rushes down by a series of cataracts between hills, to where a road crosses it to the east from Vilputty (here it is called the Munjarraar), and a short distance below receives the Vilputty, a powerful stream on the left, rushing down the ramifications of the Turdulla and Tinnewurray chain of hills, which swells it to a considerable stream; it then flows N. N. W. winding in a deep valley with shelving banks. On either side are tracts of paddy cultivation almost to Kapacad, an open spot on the right bank. In a winding it here receives a large stream from the Permal chain, and several lesser ones on the left. Rushing down the ramifications of the Tinnewurray range, it now makes many serpentine windings, labouring as it were to escape from the mountains, and ultimately precipitates itself into a deep chasm N. E. two and a quarter miles, from Koyconda; thence, confined between precipices, glides down in a thick forest over a rocky bed to the Iyempully *anni* or dam. Here a small branch of it is ingeniously conveyed into a canal from its right bank. Quitting the hills, it meanders through a forest N. W. to Mampully, a mausoleum on the

left, and Cunnavoymulla, a detached hill on the right. Here it gently assumes a northerly course through jungle, with several windings, flows half a mile west of Balsummoodrum, and passing on, receives the Wurretar on its right, and unites with the Perundelar W. N. W., two miles of the temple of Pulney. This confluence is considered sacred, and is called Shunmogen (literally six faces), by which appellation it is known in its course north. From its source it runs a course of twenty miles in a general N. N. W. direction, and, fed by mountain torrents on either bank, on quitting the mountains swells to a respectable river about one hundred yards wide with a deep bed. Across it is a dam one and a half mile S. W. of Balsummoodrum.

The Porundel river rises in the northern slopes of the southern summit of these mountains, in the open vale of Chummutancuvvay, winds gradually down it four miles, receives a powerful stream on the right, and below this confluence the road from Poomburra passes it to Vilputty; then confined winds three quarter of a mile to the N. W. and turns sharp to the N. E. and N., and, confined by lofty precipices, dashes down in a series of cataracts for four miles. On the right it receives the combined waters of the Pallunkye valley; these, pouring down in a confined cataract, give the river a N. W. course for a mile. On its left bank it receives the Poomburra stream, rushing down the slopes of Kowdamulla, flowing west of Poomburra, and receiving in its course the rivulets from the Kolatamulla hills. Thence it rapidly pursues its course along a succession of wooded valleys, and down several cataracts, until after a course of twenty-four miles it finally joins the Palar. From this stream several canals are conducted for the irrigation of several large tracts of land. It is known by seven names in different portions of its course; first, it is called the Koondur, which name it retains for several miles; afterwards the Ulular, and lastly, when it reaches the plains, the Porundalar.*

The Munnul or Putchar has its sources in the Oolurunkuvvay and Kellaven heights, forming the northern slopes of the hills, and pursues a north-easterly course down a series of steep descents, and through wooded valleys, in the progress of which it is joined by several smaller streams, and, finally, after a run of thirteen miles, falls

* As in the pages of this Journal it can scarcely be necessary to follow the minute details which the author has thought desirable for the illustration of his map, and as enough of these have been given to show how minutely he examined the courses of insignificant streams, I propose greatly abridging the remaining portion of this section of his Memoir.

into the Perandular. Two dams are thrown across this stream for purposes of irrigation, but one of them is unserviceable.

The Koodrayar has its sources in a marsh, on the west slope of the Kowdamulla hills, and pursuing a north-westerly direction, reaches the plains after a devious course of about sixteen miles, during which it is joined by several other considerable streams. As it enters the plains a dam is thrown across, and there is a deep canal on its left bank.

The Kodyurtanar, one of the feeders of the Tainar, rises on the southern heights of these mountains, and, taking a westerly direction, receives, about four miles from its source, a large stream from the Kowdamulla range on the right. Thence descending and repeatedly changing its direction, it is swelled by the addition of numerous large streams, pouring down from the hills on either side, until at Mungaputty, it is joined by the Cheggatar, after which it assumes the name of the Tainar, having now after a course of twenty-five miles, become a river of considerable note, unites with the Ambrawutty.

The Ambrawutty rises in the mountains of Tullar, east of Anymuddy, and rushing down the Unjeenad valley, is joined by the Arrewalla, a large stream, as well as by several others; flows by Nachyvile and the pagoda of Tenashy, on the left; somewhat further on it is joined by the Chinnar, forming a large stream, in which an island is formed, and then forms the fall of Jackumtavul, and, after being joined by one or two small streams, occupies a bed 200 yards in width. Here it is joined by the Poongatode on the left, and is arrested by a dam. Its length from its source till it enters the plains is about twenty-five miles. The Chinnar which falls into it has a course of about eleven miles running in a very rocky channel, and forming, from its source to its confluence with the Ambrawutty, the boundary line between Coimbatore and Travancore.

The Uttoiday is another tributary stream of the Ambrawutty, which it enters a little to the south of the confluence of the Chinnar, and forms a further portion of the boundary between Coimbatore and Travancore.

The Koondully rises in the southern mountains of Unjeenad, and, in a westerly course of seventeen miles, is joined by the Nuggraar on the right, and the Munnalar on the left, besides several other hill streams from the mountains on either side.

Roads, Passes and Defiles.—There is not one communication up to or on these mountains of an easy and gentle nature; every path leading to them has its dangers and difficulties, and as laden cattle are

constantly on the move up and down, accidents are not unfrequent, especially when the paths are steep, winding as they often do on the edge of precipices, where a single false step hurls the unfortunate animal to the bottom of some deep abyss. The path from Coimbatore across the mountains into Travancore, is, perhaps, an exception, and is much frequented by merchants travelling with laden cattle. This is the only road of note both practicable and comparatively easy. On crossing the Chinnar, it leads over a rather flat surface to the Pambar or Ambrawutty, one and a quarter mile. The cattle are here made to swim across, while the merchants pass over a temporary bridge of twenty feet space, between rocks; through this chasm the river rushes with great violence (only, however, during the periodical rains), thence it ascends a narrow ridge winding on the slope of hills, with the river in a deep hollow on the right, S. W. three and a half miles, it again ascends, and crosses a rivulet two miles, thence ascends a rugged acclivity, and along a flat surface to Shoracolum on the left, one mile. Passing a tract of paddy land, it ascends a paved defile to Keelundur, on the left three miles. From this village it ascends another defile, winds along low slopes (Khandel and Poottur on the right), and ascends, with many windings, the steep pass of Annuwurray, two miles (a road to Munnamanur here goes off to the left from the summit); it assumes a southerly course and crossing some ravines, winding over open table-land, descends to Coondullaytavalum six miles, thence in the same course, river on the left, crosses at three miles to Palacuddavu river, winding on the right, re-crosses it at Nuggraar one and a half mile, river on the left, keeps winding on easy slopes to Sundunakanultavalum, and crosses the river again below its junction with the Moonar six miles; the road assuming a southerly course, crosses the Moondrapully, on the right of which, it ascends to a pass W. N. W. of Chokanad hill, two miles, and enters the Naremungalum hills, after having perambulated a desolate tract of about thirty-one and a quarter miles from the Chinnar. This road is only frequented from January to July, and from the excessive length and difficulty, as also from rain at intervals, the merchants from Oodumullaycottah make but one trip; they start lightly laden with some cloths and culinary articles, and return with areka nut in the months of June and July; the largest portion of this time they keep moving by gentle stages.*

* In revising this portion of Captain Ward's Memoir for the press, I have been induced to take the liberty of suppressing the remainder of his rather prolix and unentertaining itinerary notices, under the impression that the country being unknown and unfrequented,

Woods and Jungle.—It has already been noticed that the summits of these regions are bare of wood, with the exception of a few stunted groves in sequestered situations. In the hollows and cavities a low brushwood of various plants entwined, mostly thorny and almost impenetrable, affords a close shelter to the wild hog. From the summit of the mountains, sloping down to the plains, the ridges, and the valleys formed by them, are crowned, the former with an open forest of various trees, among which some species of the Myrobolan are not unfrequently seen, also stunted teak. In the higher valleys, on the sides of the streams at their bottom, the forest is closely entwined with creepers, and in those at their bases, and bordering the plains, as also on some of the lower table-lands, teak, bamboos, and various timber trees thrive in quantities, especially on the northern and eastern sides; to the south there is some timber of an inferior size and quality.

Mines and Minerals.—None of any kind were observed: but the granite, which here forms immense precipices, also ridges of black

they can scarcely be rendered interesting, even to a reader about to visit the hills, and because they could not serve to direct him in his excursions without the aid of a guide. The above extract from this division of the manuscript is introduced, therefore, not in the hope that it would enable the traveller to find his way from Coimbatore to Travancore, but to show the general character of the roads by which the intercourse over these hills is carried on. From it we learn the very bad quality of the roads generally, since the best, said to be the only one both practicable and easy, is attended with so many obstacles and difficulties that it requires nearly a month to travel about thirty-two miles with lightly laden beasts of burthen. This example shows, in a striking point of view, the necessity that exists for some extra expenditure towards facilitating the intercourse, by improving the roads, between the plains and the hills, as well as between the numerous small villages scattered over them, since it is next to impossible, that any considerable advance can take place in the condition of the inhabitants, while they continue in their present almost impassable state.

The necessity for such expenditure will be rendered still more obvious, when I add that, such is the value of the products of the hills to the inhabitants of the plains, these roads, bad and almost impassable as they are, during a great part of the year, are traversed by numerous droves of laden cattle, carrying on an extensive traffic, not only between the inhabitants of the hills and plains, but between those of the plains on the opposite sides of the mountains. I would urge this measure the more strongly, because Mr. Blackburne, the very zealous Collector of Madura, has already ascertained that very much may be done to lessen the difficulties of these roads, at present in many places little better than sheep tracks, and greatly facilitate travelling, at a very moderate cost and which if judiciously expended, would, there is every reason to believe, be productive of the greatest benefit to the inhabitants. On this subject I beg leave to refer to my paper in the 15th Number, where the subject is more fully treated of.

R. W.

stones. Iron ore may be procured from the sandy beds of the streams; it may be obtained also from some kinds of black stones, but no advantage is taken of either.

Manufactures.—At Unjeenad on the west, some coarse black sugar, (jaggery), is manufactured in some quantities: ghee or clarified butter is made at all the hill villages, all, however, is consumed by the inhabitants, beside the above there is no other article manufactured on them.

Exports and Imports.—From the eastern portion of these mountains the exports to the plains may be classed under the following heads: turmerick, vendium or fennugreek, mustard, castor oil nuts, honey and wax, plantains and other fruits from the central parts; garlic is the chief export, with some mustard, wheat, wussumbu or flag root; from Unjeenad, paddy and small quantities of garlic are exported into Coimbatore. The imports to the central parts are rice (in case of a bad harvest), and to all parts of the mountains, apparel, household furniture, implements of husbandry, salt, and every other article requisite, are imported by merchants; the inhabitants also come down to the plains at stated periods, and purchase or barter for such necessaries as they may have occasion for.

Soil and Productions.—Scarce any difference is observed in the nature of the soil of these mountains, it being, in general, a stiff red clay, inclining to brown, and in the more moist situations it is a fine black mould; in the marshes, a deep black clay, the effluvia from which is considered unwholesome; it is excessively poor in lofty situations and more so in the central parts. The productions are rice, tennay, or the Indian panicle, garlic, mustard, wheat, tovarray, a species of grain similar to oats, to the east, turmerick, fennugreek, also several sorts of dry grains, as shamay, vurhaghu, raggy, &c. together with plantains, castor oil nuts, honey and wax: in Unjeenad some sugar-cane and beetle. The several sorts of dry grains produced in these regions, are only equal to the consumption, with the exception of such as are particularized under the head of exports.

Cattle and other animals.—These do not differ from those of the plains in their make or size, but appear on the whole to be in better condition, from the superiority of their pastures. The cows produce but small quantities of milk, and of an inferior quality, owing, it is

believed, to the want of salt, which the grass and herbs on the hills appear to be destitute of; as a remedy for which, the natives to the east preserve their urine in vessels and mix it in the cow's drink. The oxen, as also buffaloes, are employed in agriculture, a few of the former in carrying burdens, for which service however the tattoos are more in requisition. These small horses, being driven up in herds to the eastern hills, are very prolific and breed largely. The wild animals are the buffalo and elk who browse on the loftier hills, as also wild sheep of two descriptions, a few spotted deer in the lower regions, and the wild hog more numerous in the Kunnundaven hills. The red and flying squirrels are rare animals, seen only in the larger forests. That great animal the elephant, so famous for its depredations on fields and plantations, is never known to visit the more lofty regions, but periodically makes incursions on the lower table-lands of the eastern hills, as also into the valley of Unjeenad; they are numerous at the foot of the mountains.

Implements and mode of husbandry.—The implements in use are in every respect similar to those of the plains, in short are all obtained from the low country, and though the lands are prepared by ploughing, the garlic, mustard and wheat fields, undergo also the operation of digging and levelling, performed with the mamittys (spades); the seed being sown, the remainder of the labour of digging, weeding, and watering, devolves chiefly on the women, who are assisted by the men in taking in the harvest. Garlic produces two crops in the year, one in the month of August, the other in March. The rice fields are attended to by the polians and other classes till harvest time. The seed is sown in January and February in Unjeenad, the harvest follows in June, a second crop is obtained in January. On the hills of Poomburra and Munnamanur, they sow the paddy in October, the harvest, from the poor state of the soil, is protracted until June and July following; consequently there is but one crop obtained on these hills, yeilding an average of twelve fold. It is a singular circumstance, worthy of notice, that cranes and other birds which swarm in all the rice fields in the low country, never frequent these aerial regions, nor are any crows, kites or sparrows seen or known to visit them; the small dove is not uncommon, also blue pigeons, the latter, however, is a bird of passage, for the period they remain taking shelter in holes under precipices.

Climate.—The climate of these regions is very mild and congenial to the health of the inhabitants, the thermometer, during the months of June and July, was never observed to fall below 50_0 or above 75° ; i is, however, said to be extremely cool after the rains in January and February ; the ground is represented as covered in the morning with a hoarfrost and during this season the inhabitants complain of agues In April, some heavy showers of rain are experienced, ushered in with thunder and lightning, it is, however, warm from March till July, when they have partial showers, which increase daily, with strong bleak westerly winds, with short intervals of fair weather ; till October, during this period they are enveloped in fogs, and the rivers swell in torrents after every shower. The N. E. monsoon, which now sets in with heavy showers of rain, ceases in the latter part of December, when the bitter cold weather sets in. Unjeenad, however, is on the whole a warmer climate, notwithstanding it experiences the same vicissitudes of the seasons and is more exposed to strong winds blowing down into it from the S. W.

Origin, Customs and Manners.—The primitive inhabitants residing in these mountains are the Kunnuver Vellalers who resorted to them, it is supposed, about four centuries ago ; they may be classed with the Vellalers of the plain : yet they differ in their habits and manners, scarcely having any intercourse with each other, or forming any connection by marriage ; this latter circumstance may however in some degree be attributed to the difference of climate, the extreme cold of which the inhabitants of the low lands are unable to endure. It is still more singular that even among themselves they have peculiar habits and customs, which distinguish those in the east from their western neighbours (the latter consider themselves as something superior), and have no communication with each other in marriage. The Kunnuvers of the east, by way of distinction, invariably use a teakwood stool when performing the marriage ceremony, those to the west are not so particular. The bride and bridegroom are seated on stools, the floor of the house being previously garnished with cowdung, and fantastically ornamented with streaks of flour of corn ; when the operation of sprinkling saffron water is over, the husband performs the most important part of tying the tally, a small golden ornament, around the neck of the bride, the whole concludes with an entertainment to the relations and friends of both parties. The Puryum, or marriage gift to the relations, of the bride, is a pair of oxen, but to the west a single bullock, or sometimes a cloth is given as a present to the mother of the bride. Incon-

tinency is, however, very predominant, and a separation between man and wife not unfrequent, originating often in mere caprice. If a man feels an inclination to alienate himself from his wife, he has only to make his intention known to her parents, who receive her back with an offer of a pair of oxen; to the west, she is turned over simply with a vutty or metal dish, in use to eat victuals out of. In case a woman is displeased with her husband and absolutely wishes to part from him, she is at liberty to do so, only she must leave all her golden trinkets, if she has any, to the husband, those of silver she takes, it being considered as her own property: to the west, however, the wife is only permitted to take back such articles as she may have possessed before marriage, and if she has any children, they are left behind as the sole property of the husband. Should such separation take place when the woman is in a state of pregnancy (and in the interim she be married to another man), the child when born must revert to the legitimate father: the care and expense of nursing it, to the east, is recompensed by a donation of thirty fanams; towards the west it is delivered to the father on his demand, and no recompense made. The children of such a connection are allowed to grow up, and then return to their real father, who is bound to receive and protect them. A woman may marry as often as she chooses, but can have only one lawful husband at a time, though she may bestow her favours on another, provided he be of the same caste, any intercourse with a man of another tribe, would tend ultimately to expel her from the caste. A man may marry, if his circumstances will admit, as many wives as he pleases, for concubinage among them is not permitted, and to a man of some opulence two or three women are necessary in his domestic affairs; they are also very useful in the fields, the toilsome labour of weeding and watering devolving chiefly on them. Among the western Kunnuvers a rather singular practice is supposed to prevail in case of an estate devolving on a female from default of male issue; she is prohibited marriage, but undergoes the ceremony of being betrothed to some part of her dwelling; she is, however, allowed to have an intercourse with the opposite sex, and to the offspring of such a connection, if a male, the estate devolves. The women of the eastern parts are very uncouth and wear brass and metal necklaces, with a profusion of bangles on their arms and legs, and bore the membrane between their nostrils; the latter is also done by the women of the west, who are rather superior, and more modest in the wear of ornaments, a few stone or glass beads round the neck, called kulpashy,

and rings, are their only decorations; they wear a white cloth, not very clean, from above the shoulders, knotted in front, and made fast, round the waist with a bandage, those to the east wear theirs similar to the females of the low country. The men are very simple in their attire, having a couple of cloths, one worn round the head and the other about the waist, seldom or never wearing sandals, and by way of ornament, display a few golden trinkets pendant from their ears. Their dialect is the Tamul, which they speak fluently, but they are illiterate. The Kunnuvers burn their dead, but barren women, as also those who die of the small pox, are buried.

The Karakat Vellalers.—These people are the primitive inhabitants of Unjeenad, or five counties or portions into which this division appears to have been divided on their first settlement in these regions. They are considered a people of superior caste, their customs and manners affording indications of it, though they are not in any manner esteemed above those of the same caste in the low country. A bramin us ually performs the duties at their temple, and the other ceremonies, marriages, &c. are performed by a pundarum, or priest of their own sect, speaking the low Tamul; most of them are illiterate, but a Tamul school has of late been established at Murraoor. They are a very abstemious race, and rice constitutes their principal food, as also tire, milk and butter, nor have they any aversion to fowl and animal food, and use ghee, (butter clarified), as a substitute for oil; with it they also anoint themselves previous to bathing; they are not addicted to spirituous or fermented liquors, but opium is in use among them in moderation, and they chew and smoke tobacco. The apparel worn by both sexes does not differ in the least from that of the inhabitants of the plains, consisting chiefly of coarse white cloths; the women, besides the small ornaments worn in the nose and ears, decorate their arms with silver bracelets, and those whose circumstances will not admit of its being of silver have them made of brass; a few of the men have one of the exterior membranes of the nose bored, and all invariably decorate their ears with rings; sandals for the feet are prohibited among them—they are known to associate with the Kunnuvers to the east, though their customs and manners greatly differ; both castes make no scruple of eating what is cooked by the other, but a Kunnuver when invited to an entertainment by a Karakat, is not admitted to that part of the house where the meals are dressed, nor is he allowed to touch any of the cooking implements. This class by the laws of their sect are contract-

ed in marriage when very young, but the union does not take place until the parties are at an advanced age, owing, it is said, to a deficiency in the number of females among them; some of the men are on the above account obliged to lead a life of celibacy. A plurality of wives, which is not uncommon, is only admitted in case the first proves barren, but a connection of such a nature cannot take place without the consent of the first wife, which must be obtained, and a widow is by no means restricted, she being at liberty to marry another man, if she feels so inclined, but they often prefer remaining in widowhood. Chastity does not appear to be a leading virtue with their women.

The marriage ceremony is performed at the house of the bride; a pandal being raised before the door, under it the parties about to be united undergo ablution, they then retire into the house, and are seated on the floor, previously garnished, with their faces towards the east, a lamp is kept burning on a stool, also a measure full of paddy and a symbol of Vignashuer made of cow dung, on the head of which are stuck two blades of the arruvumpilla grass, to it the bride and bridegroom prostrate themselves, on rising, the relatives present the tally, a small golden trinket, to the bridegroom, who ties it round the neck of the bride, a basin of milk being introduced in which is steeped some arisha leaves, *Ficus Religiosa*, with which the elder relatives sprinkle some of it on the heads of the bride and bridegroom; they then get up and prostrate themselves before their joint relatives, and the marriage concludes with an entertainment; on distributing beetle to the company, the bridegroom accompanied by his bride retires to his own house, where the day after he entertains the friends and relatives. The *puryum* or marriage gift is thirty fanams, and a cloth given by the bridegroom to the bride's relations; the money is converted into jewels to adorn her person. Estates invariably devolve to the eldest son; in case there be two or more, the property is equally distributed among them. They purchase their proedial slaves the Polians, the price of a male is thirty fanams, that of a female fifty. She is considered of more value for the children she may bear, who, when born, are the property of their master.

IV.—*Meteorological Experiments made on the Goomsoor Mountains.*— *By Lieut.* JOHN CAMPBELL, *Assistant Surveyor General.*

These observations are, from the want of leisure and from the inconveniences of a moving camp, necessarily very imperfect, but, in the absence of better, they are offered to the public, for the purpose of shewing the approximate height of the hilly tract west of Goomsoor, and in the hopes they may be of some use in shewing the relation between the wet bulb thermometer and the dew point; but no inferences on this subject have been attempted, in consequence of my not having seen Professor Apjohn's formula for this purpose; and on this account some preparatory observations, made with the instrument at different places in the Northern Circars, have been added to the register.

The hilly ranges of Goomsoor form part of an elevated tract of mountainous country, which extends from Gundipoor and Battily on the Calingapatam river, on the south, up to the Mahanuddy on the north. Their average distance from the sea is about thirty or forty miles, and they extend inland in width about sixty miles, where they meet the plains of the Sompore, Potanalkaulahunchy, and Jeypore countries. The extreme elevation is 2,500 feet above the sea; the lowest 2,000 feet.

In the south they are inhabited by a race of men called Sowrahs; in the north by the Khonds : these races in manners and habits are much the same, and both are distinguished by a peculiar pectoral mode of enunciating, although the language of both is quite different. The average height of the hills above the diluvial soil which fills up the valleys between them is about 1,500 feet, they are composed of granitic, trap, and porphyritic rocks, and are generally but scantily covered with jungle.

During the time the observations were made the climate was in general pretty healthy, and although sometimes the dew point underwent great alterations, yet it was commonly pretty regular; although it was found that, before the dew in the morning had been dissipated by the sun's rays, the hygrometer commonly gave the dew point two or three degrees too low.

The thermometer used was a small one of a six inch scale by Dollond, which agreed pretty well with the thermometer in the stem of the hygrometer by Newman. The wet thermometer was a small one taken out of the ball of a Daniel's hygrometer by Jones, and the bulb

covered with muslin and wetted with common water, as it was found to give the same indications as when wetted with distilled water.

To test the indications of the wet bulb thermometer the black ball of the hygrometer was covered with muslin, and both balls being wetted the enclosed thermometer gave the same indications as the small wet bulb thermometer, and therefore there appeared no reason to doubt its accuracy on account of its being small.

The barometer was a very rough instrument on the wet tube plan, and the scale very imperfectly divided. The observations have therefore been given reduced to the temperature of 32° Fahrenheit. The mean pressure at Chicacole at 10 A. M. was found to be 29.71; at Berhampore 29.75, and at Aska 29.68, which are sufficiently accurate to give confidence in the indications of the last instrument.

The hygrometer was one on Daniel's construction made by Newman, and the observations were generally repeated on any change of the dew point to ensure accuracy.

Barometrical Observations made on the Goomsoor Ghauts.

	1836		
Monecheeserroo	22d November	8 A. M.	27.19
	———	9 A. M.	27.27
Buchingiah	27th do.	6 A. M.	27.46
	———	9 A. M.	27.60
	28th do.	1 P. M.	27.40
	29th do.	7 A. M.	27.37
	———	10 A. M.	27.42
	30th do.	9 A. M.	27.60
	1st December	Noon	27.61
	———	2 P. M.	27.49
	2d do.	8 A. M.	27.58
	5th do.	10 A. M.	27.66
Woodigherry	1st January	11 A. M.	27.86
	———	3 P. M.	27.66
	2d do.	Noon	27.74
Sarrungurrah	15th do.	3 P. M.	27.39
	16th do.	7 A. M.	27.53
Sonepore on the Mahamuddy	11th February	3 P. M.	29.24

Thermometrical Observations in the Northern Circars.

Names of place of observation.	Date.		Time of day.	Dry ther.	Wet bulb do.	Dew point.	Remarks.
	1836			°	°	°	
Munsoorcottah	July	29		84	79½	77	
		31	8 A. M.	83	80	79	Day cloudy, hot, close—no wind.
		—	4 P. M.	83	81	77	
	Aug.	2	7 A. M.	80	78	77	Morning clear, bright—heavy rain in night.
		7	3 P. M.	84	81	79	Strong wind all day—warm and damp.
		13		83	79	77	Damp day, cloudy, wind easterly.
Poondy........		22		87	80	75	Cloudy, dry, warm.
Chicacole......	Oct.	2	2 P. M.	85	71	61	Weather dry, no rain for some time.
		3	7 A. M.	77	70	67	Little dew in night.
		—	10 A. M.	81	73	66	
		5	8 A. M.	78	70	66	
		6	11 A. M.	83	70	62	
		7	10 A. M.	83	73	65	
		8	11 A. M.	84	73	65	
		13	3 P. M.	87	75	68	
		18		79	69	63	Morning cold, wind N. W. from the hills.
		19	8 A. M.	75	65	61	Cold morn. a little dew
		22		85	71	63	Dry, windy, cold.
		26	1 P. M.	85	73	66	
Calingapatam...		27	9 A. M.	81	73	69	Dry, sky clear, no rain for some time.
		28	6 A. M.	69	64	64	
		—	7 A. M.	67	65	64	
		—	9 A. M.	79	71	67	
		—	Noon.	82	69	68	
		29	7 A. M.	73½	67	64	
		—	Noon.	83	72	66	
		—	5 P. M.	82	74	69	
In camp at Itchapore....		31		79	77	75	Rain, ground saturated, tent damp, wind.
Berhampore...	Nov.	3	7 A. M.	79	76	75	Heavy rain for three days, tent damp.
		—	2 P. M.	86	77	76	
		4	6 A. M.	77	76	73	
		—	9 A. M.	81	78	75	
Aska.........		11	6 A. M.	65½	61	60	Rainy night, every [thing wet.
		—	9 A. M.	69	67	62	
		—	2 P. M.	84	68	57	
		12	7 A. M.	68	65	64	
		—	9 A. M.	73	69	66	
		—	2 P. M.	83	73	66	
		13	7 A. M.	69	67	66	
		—	2 P. M.	84	71	64	

Thermometrical Observations on the Goomsoor Ghauts.

Names of stations.	Date.		Time of day.	Dry thermom.	Wet bulb do.	Dew point.	
	1836			°	°	°	
Monecheeser-roo..........	Nov.	21	6 P. M.	68	61	58	Evng. warm, no dew.
		22	6 A. M.	56	55	55	
		23	Noon	71	62	59	
		24	6 A. M.	55	50	45	Day dry, strong wind at N. W. no dew, very cold.
		—	6 P. M.	—	—	49	Wind fallen.
		25	8 A. M.	—	—	49	Minimum in open air 43"
Buchingiah....		26	1 A. M.	49	46	45	
		27	6 A. M.	43	40	37	Minimum 34"
		28	1 P. M.	77	55	—	No dew at 42" at the time of observation, minimum 33°
		29	7 A. M.	50	47	42	Minimum 32"
	Dec.	1	6 A. M.	43	42	39	Minimum 36°
		—	1 P. M.	77	60	—	
		—	2 P. M.	80	60	—	
		2	8 A. M.	57	54	50	Minimum 36"—morning clear, hay fog lying on ground, dew copious.
		—	3 P. M.	78	60	—	
		—	8 P. M.	62	54	50	
		3	8 A. M.	70	60	52	
		—	3 P. M.	72	60	—	
		4	3 P. M.	76	61	—	Minimum 36"
		5	——	—	—	—	Minimum 38"
Bavelamat		6	7 A. M.	56	50	50	
		—	10 A. M.	70	—	50	
		7	8 A. M.	55	53	50	
		9	8 A. M.	54	52	49	
		10	6 A. M.	49	47	45	
		—	11 A. M.	65	58	49	
		13	11 A. M.	69	55	43	Minimum 35°
		15	——	75	60	—	Minimum 43° maximum in tent 78½°
		16	11 A. M.	69	57	—	
		—	3 P. M.	76	62	—	
		17	9 A. M.	69	57	47	Minimum 46° maximum 78°
		19	1 P. M.	71	61	—	
Putlingiah		20	9 A. M.	68	60	50	
		21	——	—	—	—	Minimum 36°
		22	1 P. M.	75	63	—	

Thermometrical Observations on the Goomsoor Ghauts.

Names of stations.	Date.	Time of day.	Dry thermom.	Wet bulb do.	Dew point.	
	1837		°	°	°	
Woodigherry..	Jan. 1	9 A. M.	70	55	—	No dew at 46°. This place is in a large plain of 25 square miles.
	2	8 A. M.	65	52	—	No dew at 39° minimum in tent 42° maximum 81°
	3	8 A. M.	65	52	—	No dew at 39°
	—	8 P. M.	—	—	42	Minimum 46° maximum 81°
	4	7 A. M.	53	51	45	
Cormingiah. ..	6	7 A. M.	58	52	41	
	7	8 A. M.	71	64	56	Minimum 47° maximum 76° in tent.
	—	3 P. M.	79	62	52	
	8	7 A. M.	62	59	55	Minimum 45° maximum 76°
	9	8 A. M.	67	60	51	Minimum 41°
	10	7 A. M.	70	61	52	Minimum 42° maximum 75°
	—	10 A. M.	75	62	—	
	—	2 P. M.	74	59	46	
	11	10 A. M.	76	63	52	Minimum 42°
	12	——	—	—	—	Minimum 40°
Gottingiah	14	10 P. M.	54	49	—	
Savorugudda ..	15	Noon	75	58	—	This place is a large plain, 3 miles wide and 6 long.
	16	7 A. M.	61	58	53	Minimum 45°
	17	——	—	—	—	Minimum 40°
	18	9 A. M.	72	59	48	
	—	11 A. M.	75	58	—	
	19	6 A. M.	52	52	—	Minimum 40°
	—	7 A. M.	58	55	—	
	—	8 A. M.	64	59	—	
	—	11 A. M.	70	55	—	
	—	1 P. M.	76	57	—	
	20	7 A. M.	66	57	48	Minimum 41°
	—	2 P. M.	80	61	—	
Safpayenda.....	24	Noon	86	61	—	This place is a small valley surrounded by high hills.
	—	2 P. M.	86	62	—	
	—	4 P. M.	80	60	—	
	28	Noon	84	60	—	Sun powerful.
	—	1 P. M.	84	59	—	

V.—*Suggestions for an Apparatus for Registering the Tides.*—
By Lieutenant J. Campbell.

TO THE EDITOR OF THE MADRAS JOURNAL,

Dear Sir,—Mr. Prinsep in his letter to you regarding the observation of the height and time of arrival of the tide wave, having offered no suggestion as to how the observation may be made, I therefore offer the following remarks. On the east coast of the Peninsula the surf every where prevents any possibility of ever guessing the time and heights of high water, and in the small rivers the bar is always so shallow as to prevent the influx of sufficient water, so that the head of the river is always much below the surface of the sea, and the current continues to run in long after the time of high water, until the sea has again fallen to the level of the river.

I believe an attempt was made sometime ago to register the tide by a float in the end of an iron pipe brought in from beyond the surf, but I believe it soon choaked with sand. I conceive that the required observations may be made beyond the surf, by having a large bamboo with the divisions bored through, set up beyond the surf and supported by four ropes under water, attached to small wooden anchors, the lower end may be allowed to enter six feet into the sand, and a round board fastened to the bamboo will prevent its sinking further. Above this board an aperture should be cut to allow the water to enter and the sand to fall out, which may be thrown in at top. The top of the bamboo being five feet higher than high water mark, the height of the water within the bamboo may be shewn by a rod attached to a cork float, and a flat wooden scale may be fixed on the rod with inches painted on it, which can be read off by a telescope from the shore. A piece of wire passing through a slit in the scale will ensure its being kept parallel to the shore.

A palmira tree might be used for the bamboo, the tree being split into two pieces and the pith removed, the pieces being again fastened together with rope.

I remain, dear sir, yours truly,

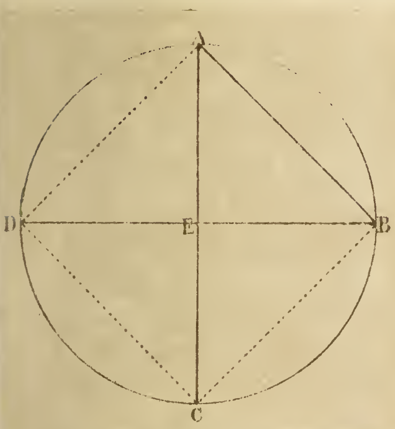
John Campbell,

Assistant Surveyor General.

23*d August* 1837.

VI.—*On the relative proportion between Circular bodies and their Squares.—By Captain* Cortlandt Taylor, *of the Madras Artillery.*

Being on a mission to the Malabar Coast connected with timber for the Ordnance Department at Madras, I found the native dealers in that article at Calicut disposed of timber cut to the *square,* varying about thirty per cent. from their measurement in the *round log.* I was induced in consequence to fall back upon school recollections, to ascertain how far this method was correct or borne out by theory, and which the subjoined mathematical process enabled me to do.* As the results, for comparative data, may be of practical utility, perhaps its dissemination will not be unattended with benefit.



Let ABCD be a circle, and the diameters AC, and BD, perpendicular to each other; then are the triangles AEB, BEC, CED, and DEA (formed by the radii of the circle and the points ABC and D being joined), right angle triangles and similar; having the common centre E a right angle in each; the legs AE, BE, CE, and DE (or circle's radii), equal; and the lines or hypothenuses AB, BC, CD, and AD, also equal, and together forming an inscribed square to the circle ABCD.

Then, as the circumferences of all circles are to their diameters, as 3.1416 is to unit; so 3.1416 is to 1, as the circumference of any given circle ABCD, is to its diameter, DB: but DB the diameter is the double of EB the radius, and EB is one leg or side of the right angle triangle AEB, of which AE is the other leg, and AB, is the third side, or hypothenuse.

Then, as in right angle triangles, the square of the hypothenuse is equal to the sum of the squares of the other two sides; in the right angle triangle AEB,—$BE^2 + AE \overset{2}{=} AB^2$: but as BE, and AE are equal, their squares are equal also, and 2, EB $\overset{2}{=}$ AB^2 or V2, EB $\overset{2}{=}$ AB, the *one-fourth* of the pevimeter of the required square.

Thus knowing the circumference of any circle, the pevimeter, or measurement of the inscribed square, can be easily ascertained; and

* The sale of the slabs pays the sawing expenses of squaring.

vice versa, knowing the square, the circle can be obtained and the difference or loss on the latter being squared is known.

PRACTICAL ILLUSTRATION.—To illustrate this demonstration by numbers. In the above figure, assume the measurement of the *inscribed square** ABCD at *one hundred* (say inches), of which the side AB is one-fourth or twenty-five. Then in the right angle triangle ABE (as before), the square of the hypothenuse (or side AB), or 25^2, is equal to $AE^2 + EB^2$; that is $625 = AE^2 + EB^2$; but as AE and EB are radii of the same circle and equal, their squares are equal also, and $625 = 2\,EB^2$; or $\frac{625}{2} = EB^2$; or $\sqrt{\frac{625}{2}} = EB$; or again $\sqrt{312.5} = EB$ (Extract root of 312—5).

312.5 (17,6776 the root,

	1
27	212
	189
346	2350
	2076
3527	27400
	24689
35347	271100
	247429
353546	2367100
	2121276

That is 17.6776 is equal to EB; but EB, or radius of the circle, being half the diameter DB, then the diam. DB, is equal to 35,355.

Again (as before) unit is to 3.1416 as diam. DB, or 35,355, is to the circumference of the circle ABCD; or thus, 1 : 3.1416 : : 35.355 (by common rule of three), to 111.072. QED.

So, as an average for any general purposes of the department to which I belong, or for any merchant or artisan in his vocation, 11 *per cent* may be used as the difference between any cylinder and its square; or, by the common Rule of Three, as 111 is to 100, so is the measurement of any known circle to the square of that circle.†

A sphere or round body *cubed*, would of course suffer double the loss, or give a difference of 22 per cent.

COCHIN—MALABAR COAST, 16*th July* 1837.

* This is working the *reverse way*, but as it enabled me to come, by a single process, to the required information, it was adopted.

† The decimal .072, or $\frac{72}{1000}$ *per cent* may, for any practical purposes, be omitted as insignificant, but should a greater degree of accuracy be required, it may be obtained, I may say, *to fractional nicety*, by the addition of unit to the *sum of per centage* of every 1400,—which would so be, $14 \times 11 = 15 + {}_4 1 = 155$; or as 1400, is to 1555 : and a half or double, &c., in proportion can also be used if necessary.

VII.—*Heights of the Neilgherry Hills.*—*By Captain* J. Underwood, *Madras Engineers.*

In the very interesting paper on the geological features of the Neilgherries by Dr. Benza (No. 13 of the Journal) the height of Sispara at the Koondahs above the sea has been recorded as about 5620 feet. Several observations by myself with a very good glass barometer fix the height alluded to at 6742 feet, and as I am not aware that a section over the hills from north to south has either been taken or published before, I have the pleasure to forward herewith the barometrical heights from the foot of the Koondah ghaut to Ootacamund, and thence down the New Seegoor ghaut to Seegoor at the foot of the latter.

Table of heights above the level of the sea:

Koondahs.	Sholay, bottom of the Koondah ghaut.	893.11	South westerly direction from Ootacamund.
	Bamboos cease	1757.6	
	Ladder hill (bottom of)	2972.	
	Vullycand camp (top of ridge)	4140.3	
	Vullyaur (river)	4050.6	
	Murraypett bungalow	6742.	
Avalanche range.	Avalanche ridge, top of,	7732.37	
	Avalanche bungalow (at bottom of ridge)	6720.2	
	Ootacamund lake level	7361	
New Seegoor ghaut.	Blink Bonnie, 4 miles from Ootac. top of New Seegoor ghaut	7204	North direction from Ootacamund.
	Sapperpoorum 1 mile down	6758.5	
	Stonehenge about 2 miles down	6182.17	
	Red Hill below Kulhutty, Burgher village about three miles down	5940.5	
Commencing at the SevenCairn Hill.	Waterfall point, proposed site for traveller's bungalow, about four miles down, and eight from Ootacamund	5538.8	
	Adam's Peak, north end of large basin, about 4½ miles down	4982.8	
	Giant's glen, about 5 miles down	4296.5	
	Tent mydan, about 5½ miles	4001	
	Bamboos begin hereabouts		
	Large nullah, bottom of ghaut	3408.9	
	Seegoor	3393.6	

It is much to be regretted that my friend Dr. Benza did not find his way down the new ghaut, for (beauty of scenery apart) the features of the country are most extraordinary, and well worthy the attention of one so capable of delighting both the scientific and general reader.

As Dr. Benza's narrative has frequently, to my knowledge, been adopted as a guide to travellers, and as on one occasion a party of five besides myself endeavoured in vain to find the "Devil's Gap" from the drawing thereof which accompanied his paper, owing to that faithful delineation being taken not from the road but from a point low down, I venture to send a rough sketch* of the Gap as seen from the route to Murraypett. The Gap alluded to is about two miles only from Murraypett Bungalow (not four as supposed by Dr. Benza), and is situated at a turn of the road immediately after descending rapidly from a high rocky bleak ridge, and at the entrance of a very remarkable narrow defile which leads to the Sispara range.

Camp Neilgherries, *July* 1, 1837.

VIII.—*Some Account of the New Colony of Western Australia, more especially of the Swan River District, the Natives, Settlers, Climate, Soil, Productions, &c.—By* William Milligan, *Esq.* m. d.—*Assistant Surgeon H. M.* 63*d Regiment—Staff Surgeon at Poonamallee.*

The new colony of Western Australia is situated on the western coast of New Holland, and extends from Cape Londonderry, in lat. 13° 44′ south, to west Cape Howe, in lat. 33° 8′ south, and Hertogs Island on the western coast in long. 112 ° 52 to 129 east longitude, reckoning from the meridian of Greenwich.

The Swan River district (the first settled, and as yet the most important) is situated in the great plain of Quartania, bounded on the north by the Swan river, lat. 32° 1¾′ long. 115° 40′; on the south by the Murray river, lat. 32° 33′ long. 115° 44′ ; to the east by the Darling range of mountains, and to the west by the Indian Ocean.

* We regret that we are unable to introduce a lithograph from this sketch, but we are necessarily obliged to be as economical as possible in our illustrations, and as a mere matter of topographical interest, we do not think one called for in this case. The sketch which accompanied Dr. Benza's memoir was intended to delineate the Gap as an interesting geological phenomenon. Captain Underwood's description will sufficiently indicate the true position, we think, for the guidance of travellers.—Editor.

Although I have called the Swan and Murray rivers the boundaries to the north and south as being fixed points, it would be more correct to say the country adjacent to these rivers, varying from one to four or five miles, the entire area being about fifty miles by thirty. Rottenest Island which is in front of the Swan river, was discovered by Vlaming in 1696.

The country is generally of the open forest description, in undulating plains, covered with a great profusion of trees, shrubs, and herbaceous plants, amongst the more important families of which are first the *Myrtaceæ* (Jussieu), comprising the *Eucalyptus*, and the guava, immediately related to it; these form nearly three-fourths of the forest. In this order we find the red gum tree *(Eucalyptus resinifera)*, the blue gum tree *(E. piperita)*, the brown gum tree or mahogany *(E. robusta)*, the white gum tree *(E. ——)*, the black butted gum tree *(E. ——)*, stringy bark tree *(E. ——)*; also the *Leptospermum*, *Callitris*, tea tree *(Melaleuca linarifolia)*, and others; these gum trees are found most useful for building purposes.

The second class in importance is the *Leguminosæ*, divisible into three principal families—the *Mimoseæ*, *Lomentaceæ* and *Papilionaceæ*. The *Mimoseæ* belong almost wholly to the genus *Acaciæ*, and are very generally diffused; amongst these are the black wattle tree *(Acacia melanoxylon)*, green wattle tree *(A. decurrens)*, and several other species. The *Papilionaceæ* include the *Gompholobium glaucescens*, and *Hovea rosmarinifolia*. The third class is the *Proteaceæ*, to which belong the *Banksia*, *Hakea*, and four species of *Grevillea*. 4th.—To the *Diosmeæ* (Brown) belong the *Boronia*, *Correa*, &c.—5th. *Dilleniaceæ* (Decandolle) different species of *Hibbertia*.—6th. The *Epacridiæ* (Brown) *Styphelea*, *Epacris*, three species.—7th. The *Compositæ* (Jussieu) *Aster*, *Bellis*, *Helichrysum albicans*.—8th. *Thymeleæ*, two species of *Pimelea* called *ligustrina* and *linoides*.—9th. *Solaneæ*, *Anthocercis albicans*.—10th. *Goodenoviæ*, several species.—11th. *Orchideæ*, several varieties; those which resemble the bee and butterfly are most admired—Umbelliferous plants and Filices. The more conspicuous plants and trees not belonging to any of these families, and which greatly contribute to give a character to the landscape, are a species of *Zanthorea*, or grass tree; a *Zamia*, or palm tree; three species of *Casuarina*, the she oak tree *(C. stricta)*, swamp oak tree *(C. paludosa)*, and forest oak tree *(C. torulosa)*; the latter make good shingles, and paling or fencing. The *Nutsya floribunda*, or cabbage tree, a singular plant, nearly confined to this part of the coast, and named after its discoverer; when in flower it much resembles the

orange tree in full bearing. The *Anthistiria australis*, or kangaroo grass; *Mesembryanthemum officinale*, or Hottentot fig; and the *Anigozanthos* (several species), a beautiful plant, called by some the 'kangaroo's claw,' from the resemblance of its flower to the fore-foot of that animal.

The trees and shrubs which are evergreens, are a great ornament to the country, and furnish fuel to the inhabitants, shelter to the cattle, and the leaves manure to the soil.

Of the indigenous edible plants which were found most useful to the early settler, are the sow thistle *(Sonchus)* Hottentot fig, the young stem and pith of the grass tree *(Zanthorea)*, wild celery *(Apium prostratum)*,* wild carrots *(Daucus sylvester)*, a species of *Orach (Atriplex Halimus)*; and samphire *(Chrithmum)*: these boiled with the salt provisions were a good substitute for spinach and other fresh vegetables. Of the edible fruits none were found deserving mention.

The soil is of three different kinds—1st, sandy—2d, alluvial—3d, red loam; the first is found near the coast, and, though unpromising in appearance, trees, shrubs, and grasses grow on it abundantly, and with the assistance of manure excellent esculent vegetables are obtained from it, as the valuable gardens in the farms of Perth and Freemantle sufficiently testify. The second or alluvial is in extensive flats, and produces admirable crops of wheat, barley, oats, &c., without any assistance from manure. The third, or red loam, which is met with on the high ground on the banks of the rivers, produces the same crops as the alluvial, but requires the assistance of manure.

There is a great deal of subterraneous moisture, which appears to be retained by a sub-soil of clay, which is to be met with at an average depth of five or six feet.

The mineral kingdom does not afford much variety; iron is abundant; mica and mica slate have been found at Kelmscott, and coal in the neighbourhood of King George's Sound. There is a blue clay of which bricks are made; calcarious rock is found along the coast; a ferruginous sandstone in several places; also soft grit,† or calcarious

* *Petroselinum prostratum*, De Cand.—Editor.

† M. Peron has attributed the great abundance of the modern breccia of New Holland, to the large proportion of calcarious matter, principally in the form of comminuted shells, which is diffused through the silicious sand of the shores in that country; and as the temperature, especially of the summer, is very high in that part of the coast where this rock has been principally found, the increased solution of carbonate of lime by the percolating water, may possibly render its formation more abundant there than in more temperate climates; but the true theory of these concretions, under any modification of temperature, is attended with considerable difficulty, and it is certain that the process is far from

sandstone, which hardens on exposure to the air, and answers well for building purposes; in some situations shells and the roots of trees are found imbedded in it ; I have not observed the trunks of trees in it as mentioned by the French navigators. The Darling range of mountains, which rise about two thousand feet above the level of the sea, and are capped with fine evergreen mahogany, are chiefly granite, with some quartz. The cleaning of the ground and the tillage are not very laborious, but, from the high price of labour, an expensive work ; oxen which cost from forty to fifty pounds per pair, and horses from fifty to one hundred and fifty each, are used in the ploughs ; and farming is carried on in the English style, as far as practicable : the crops are sowed in May, June, July, and August, and sometimes so late as September, and reaped in December, January and February; the early crops succeed the best.

Along the banks of the rivers may be seen fields of wheat, barley, oats, peas, potatoes, turnips, pumpkins, Indian wheat, &c. intermixed with fine pasture land. The sandy soil is covered with coarse herbage, on which cattle thrive remarkably well ; on the good soil, about sixteen kinds of grasses are met with, amongst which the kangaroo grass is conspicuous. The gardens furnish most kind of edible vegetables in great abundance; some of which may be obtained at all seasons. Amongst these are cabbages, endive, beet, parsley, cresses,

being confined to the warmer latitudes. Dr. Paris has given an account of a modern formation of sandstone on the northern coast of Cornwall, where a large surface is so covered with a calcarious sand that it becomes agglutinated into stone, which he considers as analogous to the rocks of Guadalope, and of which the specimens I have seen resemble those presented by Beaufort to the Geological Society from the shore at Rhodes. Dr. Paris ascribes the concretion not to the agency of the sea, nor to an excess of carbonic acid, but to the solution of carbonate of lime itself in water, and subsequent percolation through calcarious sand, the great hardness of the stone arising from the very sparing solubility of this carbonate, and consequently very gradual formation of the deposit. Dr. McCulloch describes calcarious concretions, found in banks of sand in Perthshire, which present a great variety of stalactitic forms, generally more or less complicated, and often exceedingly intricate and strange, and which appear to be analogous to those of King George's Sound and Severns Island, and he mentions as not unfrequently occurring in sand in different parts of England (the sand above the fossill bones of Norfolk is given as an example) long cylinders or tubes composed of sand agglutinated by carbonate of lime, or calcarious stalactite entangling sand, which, like the concretions of Madeira and those taken for corals at Bald Head, have been ranked improperly with organic remains. See King's Australia, appendix p. 595.—Swan river (Riviere des cygnes) upon this part of the coast, latitude 31—25 to 32, was examined by the French expedition. The rock in its neighbourhood consisted altogether of sandy and calcarious incrustations in horizontal beds, enclosing it is stated, shells and the roots and even trunks of trees.—Peron, vol. 1, p. 179—Freycinet, p. 5—170.

leeks, onions, radishes, carrots, nole-kole, parsnips, turnips, artichokes, vegetable marrow, and cauliflower; also cucumbers, pumpkins, water cresses, tomatos, cayenne pepper, and musk melon, rock melon, and water melon, in great plenty and perfection. The fruits now thriving are the grape, fig, peach, almond, apple, pear, strawberry, sloe, plum, several varieties; olive, the common and white mulberry, pine apple, plantain, sugar cane, Cape gooseberry; besides these, there are several others that will ripen here, which, in colder countries, never come to perfection; such as lemons, citrons, oranges; and much praise is due to that excellent botanist Mr. Drummond for being the first in succeeding to raise these fruits.

Of the animals I shall only mention such as are used for food, beginning with the fish, which are abundant, cheap and good. Among these are, king's fish; snapper (*sparus*); mullet (*mullus Malabaricus*); whiting (*eferianus*) skip-jack (*gasterosteus saltatrix*); flounder (*pleuronectes trichodactylus*); herring (*labrus*); sting ray (*ruja pastenaca*); cobler (*platystacus*); crawfish, crabs, shrimps, oysters, muscle, &c.

Horned cattle, sheep, goats and pigs furnish the inhabitants with meat of prime quality, milk, butter and cheese. The pig was a most useful animal; it increased rapidly, and soon supplied fresh meat for the settler, a matter of great importance in the early period of the colony, in checking the scurvy; which disease became very general from the long continued use of salt meat. The domestic fowls are turkeys, ducks, geese, pigeons, and the common fowl.

In the words kangaroo (*macropus major*) brush kangaroo (*macropus elegans*), bandicoot and opossum (*petaurus*), were tolerably plentiful; as also the bustard (*otis tarda*); emeu (*Rhea Novœ Hollandiœ*); black swan (*cygnus atratus*); cockatoo (*psittacus galeritus* and *psittacus funereus*); bronze pigeon (*colomba chalcoptera*); wild duck (*anas fera*); quails (*coturnix*) parrot (*platycercus scapulatus*) parroquets, several kinds (*psittacus formosus*); birds of paradise (*scythrops psittacus*); swamp pheasant (*cuculus phasianus*); wattle bird (*merops*); snipes and several other small birds.

Three rivers intersect this spacious valley, viz. the Swan, the Canning, and the Murray. They are supposed to have their source in small streams in the Darling range of mountains, which unite, gradually increase in size, and run from east to west, in a tortuous direction, with a gentle current, into the sea; they are affected twice a day by the tides, which render the water brackish during the summer months, but it is fresh and fit for use at other seasons. They are shallow for

the most part; in some places called the "flats" it is difficult at low water to get a boat over; the Swan is however navigable to vessels carrying three or four tons as far as Perth, that is, about twelve miles from the coast; the banks vary alternately on each side into hilly points and extensive flats, and are either sandy, alluvial or loamy, according to the tract of country they pass through. They are studded by trees, but neither the height of the banks, nor the number of trees, shade the water from free exposure to the sun and winds. Shoals of fish occasionally come up these rivers from the sea, and periodical floods occur after heavy rains, which overflow the banks and leave a deposit of alluvium on the low grounds; such a circumstance occurred in the winter of 1830. The fallen trees and stumps contribute much to increase these floods. Fresh water lagoons are numerous; there are also some containing salt water.

The water of the wells is abundant, and has the taste, odour, and transparence of the most perfect kind; it sparkles in the glass, and is found to answer to the utmost for all domestic purposes. It boils without leaving a sediment; is easily digested, excites the appetite, and may be drank freely without relaxing the stomach.

In the early period of the colony, there was some difficulty in finding good water along the coast, and in some other situations, but it was afterwards ascertained that it arose from the wells not having been made sufficiently deep. The water of some of the wells has still a darkish appearance, from not being properly cleared of roots of trees and other vegetable matter; in some places the water is impregnated with iron. In the government garden at Perth, there is a chalybeate spring which has been found useful in cases where a mild tonic is required. A small quantity of carbonic acid, carbonate of iron, and of muriate of soda, were found by analysis in this water; but I had not the means of ascertaining the exact proportions.

The strongest winds are from the north-west; the next in force from the south-west: the north wind is the hottest, and if long continued during the summer (which rarely happens) shrivels up vegetables and destroys their tender shoots. During the summer months there is a regular land and sea breeze, almost daily; the former of a morning from the east and north-east, the latter sets in about noon from the south and south-west; these winds render the intense heat of the sun less inconvenient and dangerous; the nights are cool, and the mornings and evenings agreeable. About 2 P. M. the thermometer begins to

descend, and the air gradually becomes cooler. During the winter the winds from the north-west and south-west are sometimes very boisterous; two or three gales occur in each winter, and are so violent at times as to drive ships which happen to be in Gage's roads from their anchors. However, no such accidents have occurred in the harbour of Cockburn Sound, where ships ride in great safety at all seasons. The sky in summer is clear and of a beautiful azure, without cloud, and with very little rain; moderate dews descend after sunset. As the autumn approaches, the weather becomes less serene; the sky is occasionally darkened with clouds, and lightning and thunder with heavy showers occur. These rains are in sudden heavy showers, with intervals of fair weather and sunshine. As they come after a long scorching summer they are very acceptable and beneficial, for they mitigate the excessive heat of the air, and, softening the sun-burnt earth, render it capable of being cultivated. In winter it rains for the most part of two or three days together, then an interval of eight or ten days of fine weather takes place. In damp weather a fog is seen occasionally of a morning or evening rising from the valleys and borders of the rivers, and ascending to the high grounds. Hail of a large size, about an inch in diameter, is sometimes mixed with the rain; snow has not been seen once, and ice is rare, being only seen out of doors a few times in the morning during the winter; it soon disappears after sun rise. A fire is agreeable morning and evening in the winter and in wet weather, but on the whole rather a luxury than an absolute want. The winter is a season of flowers; the beautiful *Metrosideras*, *Styphelea*, *Hibbertia*, a sweet scented little plant, called May, *Oxylobium*, and others, bloom at this season; and, as the spring advances, a profusion of others succeed, amongst which the *Anigozanthos*, *Kennedya*, *Hakea*, *Hovea*, *Helichrysum*, *Orchideæ*, *Drosera*, and *Thysanotus juncus*, or fringed violet, are conspicuous. The latter part of the spring is significantly termed by the natives, the "season of the yellow flowers," the meadows being enamelled with flowers of all colours, but the yellow predominating to a great degree.

Adjoining the Swan River district, and eastward of the Darling range of mountains, is an extensive tract of fine pasture land; the part at present settled is called Yorkshire; it is a cheerful country, well watered, covered with a short close herbage, free from underwood, and thinly timbered, and having a soil fit for raising all sorts of grain suitable to the climate. The merino and other breeds of sheep thrive well here; some of the wool has already been sent home, and brought a

high price in the London market. Salt mines have been met with in this district, near the site of a town called Beverly.

After giving these hints on the natural history of the colony, I should proceed next in order to describe the manners and customs of the inhabitants.

In the month of June 1829, His Excellency Sir James Stirling, Governor and Commander in Chief, with the Civil Officers in the ship *Parmelia*, attended by His Majesty's Ship *Sulphur*, having on board a detachment of the 63d regiment, under the command of Captain Irwin, arrived and took possession of the colony. Soon afterwards, the settlers commenced to arrive, and continued to pour in rapidly, until the latter end of 1830; at which period the population amounted to about two thousand. The ships which carried them out bore a strong resemblance to Noah's ark, being crowded to excess with all manner of beasts, birds and plants, as well as men, women and children, and provisions. If we suppose the population of one of the agricultural parishes in England, with a sprinkling of half pay officers of the navy and army, some gentlemen from the East and West Indies, and a few cockneys, put down on the shores of a wilderness, it will give some idea of the individuals who were destined to become the founders of this interesting new Colony.

The settlers may be divided into two classes, viz. gentlemen and labourers, many of them married and having young families, others single. Amongst the former, were a large proportion of highly respectable individuals, who were accustomed to refined society, with the comforts and luxuries of life; amongst the latter, were some industrious, able and valuable servants, but with these were mixed up a large number of idle and worthless men, amongst whom drunkenness was a constant vice. Perhaps it will be expected that I should say something here of the soldiers, but I may not say with Cleghorn, it is a task I would rather avoid,—pudet hæc opprobria nobis, &c. To say the least, the leaven of good amongst them was in much greater proportion than amongst the lower classes of settlers; and the complimentary address, voted to the detachment by the respectable inhabitants on its quitting the colony, is a strong proof of their good conduct.

The first object of the settler in landing was to get up a temporary shelter for himself and those in his establishment; these were for a time of a wretched description. Some used single tents, which afforded but little protection from the heat of the sun by day, and the cold and winds by night. Others were accommodated in huts built of

green wood, and pervious to every shower that fell; whilst many of the lower classes had no other awning day or night, than the canopy of heaven. After a little time, when the settlers got on their grants, buildings of a better description began to spring up. Some had wooden houses, which they brought out with them from London. Others had the same description of house made for them in the colony. Some erected houses of wattle and dab; that is, posts, about eight feet in height, erected at some distance from each other, and the intermediate spaces filled up with clay; to this was added a thatched roof and a chimney, which altogether formed a very comfortable dwelling. So soon as bricks could be made, or stone procured in sufficient quantity, good houses of such materials came into fashion.

During the first months of the colony, much anxiety was caused by the straying and loss of cattle in the bush, and by exposure to the weather of valuable plants and goods. Had any individual established a farm for the reception of cattle, and a ware-house to receive goods, it would have amply repaid him, and been the means of saving a vast deal of valuable stock and other property. No blame can attach to the government for want of arrangement on this head, as the settlers were apprized previous to leaving England, that they were to do every thing for themselves, and not to expect any assistance whatever from government. The zeal and activity, the kindness and attention, of Sir James Stirling, the Governor, in providing for all the wants and wishes of the people, so far as he had the means, were the theme of universal praise, and he was supported to the utmost by all his officers.

Travelling overland, or "travelling in the bush" as it is called, where neither roads nor houses were to be met with, though an interesting, was often a hazardous undertaking; but the danger did not arise from beasts of prey, none being met with in this country; but from the want of so simple a thing as a pocket compass. Being unprovided with this little instrument, was often the cause of many anxious hours as well as sleepless nights being passed in the bush. When the sun is clouded, so that one cannot guide his course by it, it is astonishing how readily you may go the wrong way; going a few yards out, will lead miles astray.

Things went on agreeably till about the beginning of the winter of 1830, when the supplies brought out from England, consisting chiefly of salt meat, biscuit and rum, became nearly exhausted; the crops which had been rather sanguinely calculated on, were scanty; provision reached a high price, owing to the irregularity of the supplies,

and monopoly of the merchants; a dread of scarcity of food prevailed; much fatigue, anxiety and exposure to the weather, had been undergone, and, to fill up the measure of evils, a flood took place in the rivers after heavy rains, which caused them to rise from fifteen to twenty feet above their usual level. All who had commenced their buildings on the low ground were obliged to desert them, and commence anew on higher ground. Scurvy now set in, also fever and dysentery; these diseases were mostly confined to the working classes, amongst whom there was much disease and some mortality; whilst among the higher classes, who were, comparatively speaking, well provided with food and lodging, and among whom temperance was more practised, there was but little disease and no mortality. A fear of famine existed at three different periods. Ships, however, always happily arrived in good time to prevent any mischief; the crops in the second harvest were more abundant than the first, and have continued to increase every season, in such ratio as to satisfy every competent judge that the crops of succeeding seasons will be sufficient for the whole population, and render them altogether independent of supplies from without. As the settlers got comfortably housed, and obtained vegetables from their gardens, and fresh meat from the increasing flocks, the scurvy gradually gave way, and at length ceased altogether. The fevers became fewer, and of milder character, as the country became cleared and drained.

The endemic diseases appear to be a subacute form of inflammation of the mucous membranes, viz. opthalmia or inflammation of the mucous membrane of the eye; dysentery, or inflammation of the mucous membrane of the intestines, and catarrh, or inflammation or congestion of the mucous membrane of the nares and air passages. Rheumatism was occasionally met with during damp weather in winter and autumn; also a low fever, the gastero-enterite. Providence is here, as in all other places, good and wise, and supplies remedies on the spot for the diseases which occur. Thus we find the *hirudo medicinalis* abundant in the lagoons, a well known remedy in these diseases; also aperients, as the kernel of the fruit of *Zamia*, and the produce of the *Eucalyptus mannifera;* astringents, as the red gum of the *Eucalyptus resenifera* which much resembles dragons blood, and the bark of the wattle, particularly the green, or *Acacia decurrens*, which contain much tannin; aromatics, as the *Eucalyptus piperita*, and *Leptospermum*, pennyroyal, *Pulegium;* and diaphoretics, as *Sassafras*, *Cryptocarya glaucescens*. No doubt many other medicinal plants may be obtained. I do not mean to assert that the diseases of this country are always confined

to the mucous membranes ; on the contrary, I have known them occasionally affect the serous membranes, and also the solid viscera, but I conceive this to be the tissue generally attacked, and in which disease mostly commences ; this, however, is only thrown out as a hint to future inquirers, which I do not much insist upon, my object being to record facts, rather than form hypotheses.

The exportable commodities which the soil and climate are capable of producing, are woods of various kinds, for cabinet use and for ship-building, and shingles ; the barks of several of the indigenous trees, especially that of the *mimosa*, containing tannin in a highly concentrated state ; gums of various species and qualities, particularly gum arabic ; salt of an excellent quality is found in Rottenest Island ; salt-fish has been already exported to the Isle of France and India ; seals, of the kind from which the fur is obtained, are very plentiful on the coast ; —the seal fishery will open two sources of wealth to the colonists ; the first being a trade in skins, the second in seal oil. The sperm and black whale fishery will afford articles of profitable export, and tend, also, to make the settlement important for the refitting and victualling of vessels engaged in the trade. Wheat and flour find a ready sale in the Isle of France ; it is more favourably situated for that market than either Van Dieman's Land or Sydney. Fine wool has been already exported and approved of in the London market—hides, tallow, and horns ; tobacco, wine, flax and hemp ; cotton, almonds, aniseed, bees wax, and honey ; barrilla, cheese for India and China, carraways, cochineal, coriander ; dried fruit, such as figs, currants, raisins, and prunes ; hops, vegetable oils, olives, citrons, oranges, lemons, &c. &c. to which may be added the very important article, silk.

Of the Aborigines or natives, I shall only say so much as occasional intercourse with them has enabled me to become personally acquainted with.

On the first meeting of the settlers with the natives, the latter seemed alarmed, and withdrew ; after a little time, however, they gained more confidence, and a friendly intercourse became established ; this continued for some months, during which time the natives occasionally rendered a little assistance in labour, for which they were rewarded with food, particularly bread, of which they became very fond. The propensity to thieving, inherent among the Swan River, as well as all other, savages, soon began to display itself; whenever an opportunity offered food and implements belonging to the settler were carried off; the lower classes would make no allowance for their large

organ of acquisitiveness, and chastised them severely, whenever they discovered the theft. The natives, who appear to enjoy property in common, did not understand being punished for taking their neighbours' goods, and resented the insult. They attacked the houses of the settlers, generally of those living in isolated places, distant from the towns, plundered them, and sometimes murdered whomsoever they caught in the house. They also speared the cattle, and killed and carried away the sheep. In the rencontres which took place on these occasions, several black and eleven white men were killed, and a great many wounded. The government, anxious to put a stop to these atrocities, which endangered both life and property, offered a reward for the capture of Yagan, a supposed chief and ringleader. It was not long before this daring fellow, with two of his companions, were entrapped into a boat and made prisoners; they were sent to the island of Carmac, with an instructor, and two soldiers as a guard, for the purpose of being taught our language to interpret with their countrymen. After three weeks confinement, they rose one night, while the party in charge of them were asleep, seized a boat, and regained the main land and liberty. They were now forgiven, and with the rest of their tribe, became again on friendly terms with the settlers. Their genius for thieving could not, however, remain quiet; they were soon again discovered attempting to rob a store at Freemantle which contained provisions : the proprietor being alarmed got out of bed, fired on them, and shot one dead. Their rule in such cases being the *lex talionis*, they watched an opportunity for revenge. In a few days they observed a cart laden with provisions, and accompanied by two men, proceeding into the country; they proceeded to a lonely place in the road, where the cart was to pass, and waited for it. On its arrival there, the men were attacked and both murdered. A gentleman rode up while they were in the act, fired two shots at them without effect, and identified the three principals, named Midgegoroo, Yagan and Monday. The government immediately offered a reward for their capture, dead or alive; but the miscreants evaded search for some time; at length Midgegoroo was made prisoner by Captain Ellis, superintendent of native tribes, and a party of the 63d regiment, brought in and placed in the jail of Perth on the 16th of May 1833. He was tried and found guilty soon after, and was shot on the 24th of the same month. Not long after Yagan was met by a lad, the servant of a gentleman up the country, who shot him dead. Mercy was extended to Monday, who still lives and is the most daring of his tribe.

The severe and merited punishment inflicted on these unhappy in-

dividuals, has had a most salutary effect; the tribes have ever since conducted themselves peaceably, and are now on friendly terms with the inhabitants. It would seem to have been necessary to read them a severe lesson to teach them our superiority, and this could only be done by some summary punishment. The result proves that severity in the beginning is, in such cases, humanity in the end. It is to be hoped that these examples will be the means of preventing any further effusion of blood. The tribes are now under the care of superintendents, and daily receive rations from government. This arrangement, with moderate forbearance on the part of the settlers, will no doubt be the means of saving much property and preventing the waste of many useful lives.

The natives of western Australia are of middle stature, slender in limb, and many of them with a protuberant abdomen. The only article of dress is the waistband, or noodlebul, which is a long yarn of worsted, spun from the fur of the opossum, wound round the waist several hundred times; the cloak (booka), of kangaroo's skin, is worn chiefly by the women and old men, and occasionally, in the winter time, by the young men; they wear it as a mantle over the shoulders, fastened at the right shoulder with a rush (boerno). The large skins of the male kangaroo are appropriated to the women; the single men ornament their head with feathers, dogs' tails and other matters, and sometimes have the hair long and bound round the head, the women, who are mostly plainer than the men, use no ornaments and wear their hair quite short. Both sexes smear their faces and the upper part of the body with red pigment (wilgu), mixed with grease, which gives them a disagreeable odour. Their hair is frequently matted with the same pigment. When fresh painted all over, they are a brick dust colour, which gives them a most singular appearance. They have the same practice amongst them as at Sydney and King George's Sound, of cutting gashes on their body, and raising an elevated cicatrix: it is done chiefly on the shoulders and chest, and is both a distinguishing mark for different tribes, and an honorary distinction. The septum of the nose is also perforated, in which a feather or small bone is worn. Ornaments, however, are not considered as marking the man of authority, for they are worn by the young single men. Every individual of the tribe, when travelling or going to a distance from their encampment, carries a fire stick for the purpose of kindling light; and in winter they are scarcely ever without one under their cloaks for the sake of heat. It is generally a cane of *Banksia grandis*, which has the property of keeping ignited for a considerable time. Rotten bark or touchwood is

also used for the same purpose. They are very careful to preserve this, and will even kindle a fire by friction, or otherwise, to revive it. Their weapons consist of spears of two or three kinds, which are propelled with a throwing stick (meero). They have also a knife (tapo), stone hammer (ugardee), and curl koilee, or curved flat weapon, similar to the bomerang of the New South Wales natives.

The spears (gudye) are made of a long slender stick, about the thickness of a finger, of a heavy tough quality, supposed to be the black wattle; they are scraped down to a very fine point, and are hardened and straightened by the assistance of fire. Those intended for hunting and fishing, called moongaul, are barbed with a piece of wood fastened on very neatly and firmly with kangaroo sinew (peat), and the ligature covered with gum obtained from the grass tree. They are about eight feet in length; the war spears are longer and heavier, and are armed, for five or six inches from the point, with pieces of sharp stones fixed in gum, resembling the teeth of a saw, the stones increasing in size, the smallest being at the point; glass has been substituted for the stones where broken bottles have been found; each man carries from two to five spears.

The throwing stick (miero) is about two feet long and four inches wide, narrowing at each extremity; at the handle is fixed a piece of gum (wank), in which is inserted a sharp edged stone (tannela), which is used to scrape the point of the spear when blunted by use. At the outer end of the mecro is a small wooden peg (picota), which is inserted into a hole at the end of the spear, and by which it is propelled. The miero is also used at close quarters in their fights.

The hammer (uguadu) is made with a lump of gum having two stones imbedded in it, stuck on to the extremity of a short stick; it is used in climbing trees, in throwing at and killing animals, in breaking down grass trees, and for the common purposes of axe and hammer.

The knife (tapo), is a stick with sharp edged stones fixed in a bed of gum, at the end and for two or three inches down the side, forming a serrated instrument. The koilee, or boomering, is seldom used as a weapon, but for skinning the kangaroo, and also for amusement; some are curiously carved.

Their wigwams (boorno) are merely composed of a few small twigs stuck in the ground, and bent over in the form of a bower, about four feet high and five or six wide. They thatch them slightly with the leaves of the grass tree; in rainy weather they are roofed with pieces of bark, upon which stones are placed to secure them from being blown away; but they afford a miserable protection from the weather. They

are generally erected in a sheltered spot, near water, with the back towards the prevailing wind, and a fire is kept burning constantly in the front; one hut contains several individuals in a crowded state—the dogs, also, are admitted to a share of their bed. An encampment rarely consists of more than seven or eight huts; for, except during the hunting and fishing season, at which time large parties assemble together, their numbers are generally small, and two or three huts suffice. The number of individuals, however, seldom exceed fifty. The huts are so arranged as not to overlook each other; the single men have one to themselves, the children sleep with the women in a large hut near the husbands: these encampments generally consist of near relatives, and comprise families rather than tribes.

Those families who have locations on the sea coast, quit it during the winter for the interior, and the natives of the interior in like manner pay visits to the coasts during the fishing seasons. As the country does not abound in food, they are seldom stationary, removing, according to the time of year, to those parts which produce the articles of provision which may be in season. During the winter and early spring they are very much scattered, but as summer advances they assemble in greater numbers. It is at this season that they procure the greatest abundance of game; it is done by setting fire to the dry underwood and grass which rapidly burns. With a kind of torch, made of the dry leaves of the grass tree, they set fire to the sides of the covert, by which the game is inclosed and cannot escape. The hunters, concealed by the smoke, stand in the paths most frequented by the animals, and spear them with facility as they pass by. On these occasions vast numbers of animals are destroyed; the violence of the fire is frequently very great, and extends over many miles of the country, but this is generally guarded against by their burning it in consecutive portions. The women also kindle fires, but only for the purpose of taking bandicoots; they sometimes however, accompany the men at the larger firings for kangaroos or waleby. As soon as the fire has passed over the ground, they walk over the ashes in search of lizards and snakes, which are thus destroyed in great numbers, and those which have escaped their holes are easily discovered. In the chase the hunters are assisted by dogs, which they catch young and domesticate; but they take little pains to train them to any particular mode of hunting. In size and appearance they resemble our fox hounds; they appear to have a very fine scent, and draw upon their game like a pointer, after which they spring

upon or chase it. When the owner does not wish the dog to follow, he ties the foreleg to the neck with a band of rushes, and leaves him in a shady place; he frequently carries the dog on his shoulders. They are excellent watch dogs, and will attack strangers; in the wild state they are sometimes killed by the natives, who eat their flesh, but of the skin no use is made. The mode in which they hunt the kangaroo is in small parties, or singly; they select a time when the rain is pouring heavily, or the wind blowing hard, to prevent the noise of their approach being heard, for the kangaroo is very quick in hearing, and always on the alert. The hunter creeps upon them with the greatest caution, and generally succeeds in approaching them unobserved. If possible they keep the wind in their face, and when one is observed, they take off their cloak, and when the animal stoops or turns his back upon them they hastily advance, keeping a bush between them for concealment. As they approach their prey, they move very lightly in a stooping posture, and only at the time when the noise of the wind prevents their footsteps being heard. Should the kangaroo turn round and observe them, they instantly stop and remain perfectly motionless until he resumes his feeding. In this way they approach within a few yards of their prey, and then pierce him with their spears; the instant he falls they run up and dispatch him with their hammers by blows on the head. The first operation is to extract the two front teeth of the lower jaw, which they use to sharpen spear points; then they seize the tail, and, taking the end in the mouth, bite off the tip, and by pulling, extract the sinews which are inserted in it; these are bound round a stick, and dried for use, either for the purpose of stitching the mantles or tying the barbs on the spears. Another mode of hunting the kangaroo, when huntsmen are numerous, is by surrounding and gradually approaching the game, until they get sufficiently near to spear them.

The emu is speared chiefly in the winter, at which time they lay their eggs; when a nest is found, the hunters conceal themselves behind a bush near it, and endeavonr to secure the male bird first; the female they are pretty certain of, unless she has been disturbed, when she will forsake the nest. Emus however are not very often procured by the natives, but with them kangaroos are highly esteemed as articles of food; lizards also afford a favourite repast, and, at some seasons, form a considerable portion of their food; there are three species that are eaten. The snakes which are eaten by the natives are of several kinds; when the natives kill one they are careful to beat its head to pieces before they take it up; they then examine if it has recently

eaten, and if it has indigested food in its stomach, they reject it; for, if eaten, they say it would cause violent vomiting. At the spring time of the year they live principally upon the eggs and young of birds, chiefly of the parrot tribe, but also of hawks, ducks, swans, pigeons, cockatoos, land turtle, &c. They are extremely expert at climbing trees, which they do by notching the bark with their hammers, in the same manner as is practised in Port Jackson. Thus they procure opossums, which they trace to their holes by the marks of their claws upon the bark; there are two species, one the common ring-tail (uwarra), the other, comal: they are not often found in the same districts, the cernul living chiefly in lofty and thick woods, whilst the ring-tail is frequently found in swamps, and the low brush which surrounds them. The comal is of larger size and much lighter colour, with a brownish bushy tail; it is also fatter, the fur is longer, of a whitish colour, and is spun by the natives into a kind of worsted, called by them peteroe, of which the noodle buls are made; the fur of the ring-tailed opposum is not used. That of both species is easily detached from the skin. The comal is frequently hunted with dogs by moonlight, when it is either speared in its flight, or driven to its haunt in some hollow tree; the natives then make a hole, and extract it, but should it be too difficult or troublesome, they kindle a torch of grass-tree leaves and push it into the hole, when, in attempting to escape, the animal is easily taken.

During the summer and autumn months the natives derive a large proportion of their food from fish. They have no canoes, neither do they swim well. They have neither nets, nor hook and line, and the only weapon they use is the spear, with which they are very dexterous. In the mouths of streams they take large quantities by weirs made of bushes; but the most common method is pursuing the fish into shoal water and spearing them, or as they lie basking on the surface. Fish being very plentiful, they often kill more than is sufficient for present use; in this case they roast them, and, separating the flesh in large flakes from the bones, pack it carefully up in soft bark, in which way it will keep good for several days. Immediately on killing a large fish, they make a small opening just below the gills, through which they extract the entrails; if there be any fat, it is carefully separated; the bowels, liver, &c. they cook and eat. Although sharks are numerous, the natives are not at all alarmed at them; sometimes they will spear them, but never eat any part of the body. Sting-rays and maiden-rays are also common, but not eaten; though sometimes killed for amusement. Crawfish ("challons") and prawns, are to be

obtained in the Swan river in some quantities, the natives roast them in the ashes and eat them. Frogs ("cooyah"), of two or three species, are eaten, chiefly at the season of their spawning. Grubs of different kinds are eaten raw or slightly roasted; the eggs of the ant also form an article of food. Of the vegetables on which they feed a few kinds only are known; the following, however, are more used than any other, and may be said to form the staple article of diet: boom, wyeing, matta and sudening bean boovulerang, a species of yam which they are very fond of; the boom are scarlet roots, not unlike in shape and size to tulip roots. They roast them in the ashes, and then pound them between two flat stones, rubbing the latter with a ball of earth to prevent the root adhering to it; when thus prepared they are mucilaginous and of a glossy black colour; they may be considered the bread of the natives who live near the coast. The wyang is of the tribe *orchideæ*; it is very pleasant eating when roasted. The mutta is the small bulbous root of a rush; it is very fibrous, and only edible at one season; the roots of fern, sedge, and other plants, are also used as articles of food; also mushrooms of two species, and another kind of fungus. When the different species of banksia first come into bloom, they collect from the flowers a considerable quantity of honey, of which the natives are particularly fond, and gather large quantities of the flowers "monca" to suck; it is not, however, always to be procured: the best time is in the morning, when much dew is deposited on the ground; also in cloudy but not wet weather.

The natives at Swan river live upon the productions of nature, unassisted by art, varying at different seasons and in different districts; poor in quality, often scanty, and therefore compelling the natives to a vagrant life. The population consequently is far from numerous—they have no general chief, and associate and disperse as season or inclination leads them. Their wars appear to be more between individuals or families, than between tribes or districts. There are numerous subdivisions into tribes and classes, who appear to have little bond of union between them; the men go two or three together, unless they have some particular object in view; they are extremely jealous of their food, concealing and eating it silently and secretly; yet if others are present they usually give a small portion. When they are successful in hunting or fishing, they instantly make a fire, and eat a portion of their fish or game; the married men generally reserve a share for their wives. Of the children they appear to be very fond, and rarely chastise them; but their treatment of the women is not always so gentle, and

many of them have spear wounds in the legs or thighs, inflic ed by their husbands. The women are very useful to them, not only in procuring food, but also in preparing their cloaks, building their huts, and other menial offices. They possess few utensils, and these are of the rudest construction; a piece of soft bark, tied at each end, serves for a drinking cup; the claw of a kangaroo they use for a needle, and through a hallow rush, or the wing bone of a bird (neveel), they suck the water, when it cannot be conveniently reached with their mouth. Polygamy is a general practice amongst them; one man sometimes having many wives. The girls appear to be at the disposal of the father, and are generally bespoke in their infancy; even before they are born we are told they were betrothed, if they prove to be females. The persons to whom the girls are betrothed are not unfrequently men of middle or advanced age, and possessing already several wives; they are, however, often more equally matched. Like those of other savage tribes, the women suffer little from child-bearing, and even the next day walk out to seek their food as usual. For the first few weeks the child is carried on the left arm in a fold of the cloak, but subsequently is suspended on the shoulders; until they can run alone, they are not clothed. In cases of twins one of the children is killed (of different sexes, the female being preserved), the reasons assigned for which measure are that a woman has not sufficient milk for two children, and cannot carry them and seek her food.

When individuals quarrel, it is taken up by their respective families; when a man is killed, his tribe instantly sets about revenging his death, but they are not particular whether they kill the principal offender or any other of his tribe. This feeling of retaliation is, however, extended much farther; for if a man be killed by accident, the friends of the deceased will impute his death to some bulgal (or doctor) of an adverse tribe, and kill an individual belonging to it in retaliation. Also when a man is seriously ill, and fancies he shall not recover, he will attempt to kill some body, in hopes thereby of recovering. In their personal conflicts, they use their hammers, throwing-sticks, and towks, to strike with, and the blows therewith inflicted would doubtless frequently be fatal, but they seem incapable of giving a heavy blow, and strike more like women. For depredations in each others grounds, or any slight cause, they are contented with spearing through the legs or thighs, and do not attempt to kill each other, and the moment one of the party is wounded the engagement ceases.

They have their doctors (bulgal) who attempt their cures by charms. On one occasion I witnessed the remedies applied for a sick child: the doctor inhaled the perfume of different plants, and then breathed into the mouth of the child; this was repeated several times; he also sat on the haunches like a monkey, and grinned most hideously at the child, jumping about occasionally, and repeating the grimace; he likewise rubbed his hand over the chest and stomach repeatedly, and snapped his fingers in the air. A native was one day writhing with pain on the ground in the barrack square; the bulgal approached him, and, with a piece of glass, cut from the angle to the symphisis of the chin on the right side. On looking into his mouth afterwards, to ascertain his disease, I saw a hollow tooth in the opposite side.

The diseases which they are chiefly subject to, are dysentry, opthalmia, catarrh and rheumatism, and these occur but seldom. Their poor diet, want of clothing, and the miserable huts they dwell in, will readily account for their suffering from vicissitudes of the weather which give rise to these diseases. It is only surprising that they are so remarkably healthy.*

Previous to entering upon a description of the weather, I shall first offer a few remarks on the topography of the town of Perth, where these observations were made.

Perth, the seat of government, is situated on the northern bank of the Swan river, eleven miles from Freemantle, on a gentle elevation, thirty feet above the level of the river, and about forty above the sea. It is bounded to the south by the Swan river, which is three quarters of a mile broad opposite the town; to the north by a string of fresh water lagoons, which are continuous up to the mountains; to the east by an extensive plain terminating at the Darling range of mountains twenty miles distant; and to the west by mount Eliya, which, running north and south, affords considerable protection from the strong gales coming from the north west and south west. The Swan and Canning rivers unite immediately below the town in a large estuary, called Melville water: this fine expanse of the meeting of the waters much resembles two large lakes running into each other. The sea breeze in reaching the town is further cooled down during the hot weather by crossing these waters. The soil is light, dry and sandy, with the exception of the banks of the river, which is alluvial. The substratum

* For a full account of the natives of King George's Sound, see in Geographical Journal and King's Australia.

is sandstone ; the water in the springs abundant and wholesome, in some places impregnated with iron. The principal streets are ninety-nine feet wide ; one street runs about a mile in length, and is intersected at right angles by several others : the houses are built of brick and mortar and some of wood; they are placed on separate allotments, each ninety-nine feet wide and three hundred and ninety-six feet long, which are fenced in ; a portion of the ground is generally converted into a garden ; the gardens in front of the houses, and the large trees interspersed between, with the boats passing up and down the river, give the town a cheerful and picturesque appearance. The streets are not yet paved, but there is an agreeable walk along the bank of the river, and the rides about the town, along the bush roads to Guilford and Freemantle, are pleasant. Population three hundred.

It may be said of Perth as Hippocrates formerly said of towns similarly situated, well exposed to the sun and winds and abundantly supplied with good water (De agre locis et aquis—Opera omnia, page 195), hæ minus a mutationibus temporum officiuntur: and diseases are less severe and less common here than in most other places.

I may also here mention Freemantle, the town second in importance, which is situated on the coast close to Gage's roads, on the southern bank of the Swan river, where it disembogues into the sea. The streets run at right angles, are sixty-six feet wide. The houses are built of a soft grit or calcarious sandstone, which hardens on exposure to the air, looks well, and is found in abundance in the neighbourhood. It is chiefly inhabited by merchants population about three hundred.

There are several other towns in progress, the most advanced of which is Guilford, situated about eight miles higher up the river than Perth, on a pleasant terrace, in an agreeable neighbourhood, where the soil is uniformly good.

These things being premised, I proceed to describe the most remarkable changes of the weather during the four years included in this notice.

Whenever the thermometer is mentioned, it is to be understood of a large mercurial one, graduated according to Fahrenheit's scale, kept in a proper place within doors (either in a wooden building or a thatched hut, with a southern aspect) except when I describe the sun rays, the intensity of which was measured by a smaller instrument of the same kind, hung out of doors, at some distance from the walls of the houses; no difference was observed between them, except that the mercury in the smallest was soonest affected by heat or cold, and consequent-

ly a little quicker in its motions, which occasioned it being found a degree or a degree and a half higher in summer and as much lower in winter, than the quicksilver in the larger thermometer. The difference between the heat of the air warmed by the direct rays of the sun, and that within doors was on an average 18 degrees; whenever it was remarkably greater, notice will be taken of it. The observations were made at 7 A. M., 2 P. M. and 7 P. M. The highest degree of heat generally occurred at 2 P. M., soon after which period, the sea breeze had fully set in at Perth, and the thermometer commenced to descend. The height of the thermometer at a medium is calculated from its average height at these different hours. The barometer was included in the same case with the thermometer, the whole made by Cary of London. It was occasionally heard that the barometer rose a little before wet weather, but this was an exception to the general rule. I regret the want of an hygrometer prevented upon me from ascertaining the exact dryness or humidity of the atmosphere; but this deficiency is in some measure supplied by the number of rainy days being noted, as well as by extracts from the register of the pluviameter kept by my friend A. Colin, Esq. Colonial Surgeon at Garden Island and Perth—for which see Table at the end.

1830, *March.*—Was fine for the most part, a little rain fell on the 11th, also on the 24th, at new moon; heavy rains on the 18th, lightning and thunder on 31st; prevalent winds E.—N. and N. E.

	Max.	Med.	Min.
Thermometer......	88	73½	58
Barometer.........	30.30	30.05	29.80

April.—Early part cloudy and showery, middle fine, latter end cloudy; showers fell on 1st, 4th, 5th, 6th, 7th, 16th, 24th, 27th and 30th; lightning and thunder on 16th, 22d, 24th and 27th; winds N. W.—S. W. and N. E.

	Max.	Med.	Min.
Thermometer......	87	68½	54
Barometer	30.30	29.95	29.60

May.—Fine till 13th, when some rain fell in the evening, preceded by thunder and lightning; on the 14th very loud thunder and lightning with much rain; on 15th (last quarter moon) 20th and 21st heavy rains; a gale of wind on 21st from the south-west, which did much mischief

to the shipping in Gage's roads, light rains on the 22d, 23d, 24th, 25th 27th, 28th, 29th, 30th and 31st; winds N. W. and S. W.

	Max.	Med.	Min.
Thermometer......	84	63¾	45
Barometer	30.30	29.82½	29.50

June.—Much rain with thunder on the 1st; it continued fine afterwards till 13th (last quarter of moon), on which day and 14th March rain fell; heavy rains on the 21st, 22d and 23d; slight rain on 27th; remainder fine. Hoar frost early in the mornings of 2d, 3d, and 4th; winds north-east, north-west and south-west.

	Max.	Med.	Min.
Thermometer......	70	55½	40
Barometer	30.15	29.82½	29.50

July.—Heavy on the 1st, 2d, 4th, 5th, 6th, and 7th. Ice, the thickness of a shilling, out of doors, on mornings of 10th and 24th. It rained daily from 13th to 22d, with the exception of 19th, which was new moon. It also rained on 27th and 28th; lightning and thunder on 7th and 13th. Heavy squalls with hail stones, thunder and lightning, on 15th. Winds N. E.—N. W.—and S. W.

	Max.	Med.	Min.
Thermometer......	65	51⅜	34
Barometer	30.20	29.91¼	29.62

August.—It rained much on fifteen different days viz. 4th to 10th, (last quarter of moon), 16th, 19th, 20th to 24th, and 31st, with squalls from north-west and south-west; remainder fine; prevalent wind S. W.

	Max.	Med.	Min.
Thermometer......	76	57¼	38
Barometer.........	30.35	30.07½	29.80

September.—Was warmer and drier than the preceding months, it rained on 1st, 2d, 9th, 14th and 19th. Winds N.—N. W.—and S. W.

	Max.	Med.	Min.
Thermometer......	80	59¾	44
Barometer.........	30.40	30.15	29.90

October.—Was fine with the exception of 1st, 2d, 7th, 8th, (last quarter of moon) 19th, 10th, 15th, 16th (new moon) 17th, 18th, 25th and 27th, on which days rain fell. Heavy squalls on the 9th; thunder

and lightning on 10th, 17th and 18th. Winds N. E. and S. W.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	78	62¾	46	Barom.	30.35	30.02½	29.70

November.—Twelve fine days, twelve cloudy, six rainy, viz. 3d, 4th, 22d, 23d, 29th and 30th (full moon); much lightning and thunder on evening of 22d at first quarter of the moon; winds N. E. and S. W.

Therm.	93	71¼	54	Barom.	30.25	30.02½	29.80

December.—Hot and dry, with the exception of 10th, 22d, 23d, 24th and 28th, on which days rain fell in slight showers. The thermometer at 103° in the shade, and 123° exposed to the sun's rays on 17th. Winds N.—N. E. and S. W.

Therm.	103	81½	62	Barom.	30.20	30.00	29.80

The prevalent diseases of this year were dysentery, opthalmia, fever, catarrhs and scurvy. A mild form of dysentery was the disease most commonly met with; cases have occurred in each month, but it prevailed most in April, after the weather began to break, with heavy rains, thunder and lightning: the medium range of the thermometer for the month being 68½, that of the barometer, 29.95.

1831.—The character of the seasons was, on the whole, milder in 1831, than in 1830; the winter more temperate, the rains more equally distributed through the seasons, and the winds more moderate. No severe gale occurred; during the summer the heat was less oppressive, and the medium range of the thermometer for the month of December five and a quarter degrees lower than the corresponding month of last year.

January.—Hot and dry, except on the 5th, 13th and 14th, when some slight showers fell, at the changes of the moon ; the 22d, 23d and 24th were very sultry, the thermometer rose in the shade to 102°, 104, and 106 at 2 P. M. on these successive days ; and when exposed to the sun to 123, 127 and 130. The wind was from the north the greater part of the month : this is the hot wind of the colony ; while it prevails, the weather is very sultry.

Therm.	106	82¾	68	Barom.	30.10	29.91¼	29.72½

Prevalent disease dysentery. During the month of February the regular land and sea breeze occurred almost daily ; thunder and light-

ning on 7th, 12th, 13th and 14th, with rain on 7th and 14th. A few cases of ephemeral fever and rheumatism were met with.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	102	$80\frac{1}{2}$	62	Barom.	30.20	$30.02\frac{1}{2}$	29.85

March.—Was generally fine; some showers fell on 27th and 28th at full moon; the land and sea breeze very regular. In the early part of the month slight opthalmia appeared, towards the latter end, dysentery and fever.

Therm.	96	$76\frac{3}{4}$	56	Barom.	30.20	$30.02\frac{1}{2}$	29.85

April.—Was fine for the greater part; the 10th, 29th and 30th cloudy and windy, with some rain; winds N. E. and S. W. The nights were cold. In the early part dysentery continued to prevail; about the middle and latter end scurvy.

Therm.	98	$72\frac{1}{2}$	48	Barom.	30.25	30.10	29.95

May.—Was variable with heavy rains on 5th, 6th, 7th, 8th, 14th, 18th (first quarter of moon), 19th, 20th, 21st and 22d, and dew at night. Winds N. E.—N. and S. W. Scurvy and catarrhs most commonly met with; also a few cases of pneumonia.

Therm.	78	$63\frac{1}{2}$	44	Barom.	30.40	30.15	29.70

June.—Was variable; the showers were frequent, but neither long continued nor heavy. Rain fell on 5th, 8th, 9th (new moon), 10th to 16th (first quarter), 17th, 21st, 22d and 23d; a severe thunder storm on the night of the 13th. Scurvy and catarrhs continued to prevail.

Therm.	70	58	38	Barom.	30.30	29.90	29.50

July.—Was fine with the exception of 4th, 5th, 6th, 7th, 8th, 15th, 16th (first quarter), 17th to 21st, 25th, 27th and 28th, on which days much rain fell. A severe thunder storm on the 8th, with a shower of hail. Ice was found out of doors about the thickness of a shilling on the morning of the 9th (new moon). Winds N. E.—N. W. and S. W. There was but little disease.

Therm.	67	$54\frac{1}{4}$	53	Barom.	30.40	30.05	29.70

August.—A good deal of rain fell on 3d to 6th, 9th, 10th, 11th, 18th to 22d (full moon) 24th to 29th (last quarter). It blew very fresh on the 5th, but there was not any such severe gale as occurred last winter. Winds N. E. and S. W. Catarrhs sometimes met with.

Therm.	76	$59\frac{1}{4}$	42	Barom.	30.40	30.10	29.80

September.---Thunder on 2d, 10th and 19th; mostly cloudy and showery on 2d, 3d, 4th, 7th, to 11th, 16th, 18th, 19th and 22d. Winds N. W.—S. W. and N. E. A few cases of ephemeral fever and catarrh.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	78	$62\frac{1}{4}$	45	Barom.	30.30	30.00	29.70

October.---Was cloudy and fine alternately; it rained on 7th to 13th (first quarter), 16th to 20th (full moon); remainder fine. Winds N. E. S. W. Catarrhs and ephemeral fever.

Therm.	79	63	48	Barom.	30.40	$30.07\frac{1}{2}$	29.75

November.---Was squally and rainy at beginning; latter part fine. It rained on 3d, 4th, 5th, 6th, 8th, 9th, 18th, 19th (full moon), and 27th. During the early part no diseases; during the latter opthalmia. The 25th was very sultry. Thermometer in the shade at 95°; exposed to sun 130°. Winds W. and W. by S.

Therm.	95	$69\frac{3}{4}$	54	Barom.	30.15	$29.90\frac{1}{2}$	29.66

December.—Was generally fine, and cooler than the corresponding month of last year, the medium range of the thermometer for the month being $5\frac{1}{4}$ degrees lower; slight showers fell on 23d, 28th, 29th and 30th. Winds N. E. and S. W. The opthalmia which commenced in November continued throughout this month.

Therm.	96	$76\frac{1}{4}$	60	Barom.	30.25	$30.07\frac{1}{2}$	29.90

The prevalent diseases of this year, were similar to those of the last, viz. dysentery, opthalmia, fever, catarrhs and scurvy.

1832.—The weather this year was more variable and damp than either of the two preceding; there were a greater number of rainy days, and the winds have been generally higher, though no severe gale has occurred.

January.—During the early part fine, the middle cloudy, latter fine; lightning on 4th and 6th, loud thunder on 31st; rain on 15th (full moon) and 31st. Winds N. E. and S. W. Ephemeral fever the prevalent disease.

Therm.	99	$76\frac{1}{4}$	61	Barom.	30.10	29.95	29.80

February.—Fine with the exception of eight cloudy days, on three of which it rained, viz. 3d, 4th and 10th; thunder on 3d and 26th. Winds N. E. and S. W. Opthalmia prevalent.

Therm.	106	$78\frac{3}{4}$	60	Barom.	30.10	$29.97\frac{1}{2}$	29.85

March.—Generally fine. Thunder on 4th, with heavy rains on 4th and 5th, and light rains on 6th, 19th and 30th. Winds N. E. and S. W. But little disease met with; a few cases of dysentery towards latter end.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	95	77$\frac{3}{4}$	62	Barom.	30.20	29.90	29.60

April.—Was alternately cloudy, showery or fine, like April in England. It rained on 4th, 5th, 7th (first quarter of moon), 8th, 11th, 18th, 20th, 21st, 22d (last quarter of moon), 23d, 26th, 27th, 29th, 30th (new moon); a thunder storm on 8th. Winds N. E. and N. W. Dysentery the prevalent disease.

Therm.	92	71	50	Barom.	30.30	30.10	29.90

May.—Rain fell on 1st to 6th (first quarter of moon), 9th to 13th, 17th, 18th, 20th, 21st, 25th and 26th. A heavy squall from N. W. on 18th. Winds E. N. E. —N. W.—S. W. Rheumatism.

Therm.	77	61	46	Barom.	30.50	30.00	29.50

June.—It rained on 4th, 5th (first quarter of moon), 6th, 8th, 9th, 10th, 13th, to 17th, 21st to 25th. Hoarfrost and ice on 3d—a thunder storm, and large hail stones on 8th, with a heavy squall from S. W. Ephemeral fever.

Therm.	74	59	44	Barom.	30.60	30.20	29.80

July.—Was for the most part fine; it rained on 2d to 6th, 15th, 17th, 18th, 19th, 20th, 27th, 28th, 29th and 31st. Ice seen out of doors on mornings of 1st and 9th. Heavy squalls on 4th and 17th, attended by showers of large hail stones. Winds N. E.—N. W. and S. W. There was but little disease, chiefly catarrhs and rheumatism.

Therm.	70	55$\frac{1}{2}$	40	Barom.	30.35	29.97$\frac{1}{2}$	29.60

August.—Rain fell on the 1st, 4th, 8th, 12th, 18th (last quarter of moon), 19th, 23d, 29th, 30th and 31st; thunder storm on 11th. Heavy dew at night. Winds N. E. and S. W.

Therm.	79	59$\frac{1}{2}$	44	Barom.	30.30	29,97$\frac{1}{2}$	29.65

September.—Was cloudy, squally and rainy, much rain on 1st (first quarter of moon), and some on 2d, 3d, 4th, 6th, 7th, 12th, 13th, 14th, 15th, 18th, 20th, 21st, 22d, and 23d (new moon); thunder storm on 18th. Winds N. W. and S. W. Catarrhs, pleuritis and rheumatism.

Therm.	76	61$\frac{1}{2}$	50	Barom.	30.30	29.97$\frac{1}{2}$	29.65

October.—Was squally and showery during early part; the middle fine; latter end, squally and rainy. Ephemeral fever, with, derangement of the biliary system, and cholera morbus, the prevalent diseases. Some rain on 1st (first quarter of moon), 2d, 3d, 6th, 7th, 8th; much on 9th (full moon); some on 10th, 13th, 18th, 21st, 27th, 30th, and 31st (first quarter of moon).

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	76	62¼	50	Barom.	30.25	29.87½	29.53

November.—A thunder storm and gale of wind, with heavy rain, on 1st; cloudy, showery and rainy on 9th: thunder storm on 10th; cloudy and showery on 18th, 19th, 20th, 21st, 22d and 23d; remainder fine. Wind S. W. Disease opthalmia.

Therm.	86	64½	52	Barom.	30.40	30.10	29.80

December.—Early part cloudy and showery, thunder storm on 4th middle fine, latter part squally and rainy, some rain on 1st to 5th, 10th, 30th and 31st. Winds N. E. and S. W. Cephalalgia and boils.

Therm.	101	75	60	Barom.	30.10	29.90	29.70

The total number of cases of disease have been about one-third less this year than the last, and nearly one half less than in 1830. The diseases most frequently met with have been fever, rheumatism, and opthalmia; occasionally catarrh and cynanche tonsillaris; dysentery but seldom, and scurvy has nearly disappeared.

1833.—The weather this year was variable and damp, though less so than the preceding.

January.—During the early part was cloudy, middle fine, except on 16th and 21st when there was thunder and heavy rains; latter end fine; nights cold and heavy dew. Winds S. W.—S. E. and N. E.

Therm.	99	77⅓	59	Barom.	30.20	30.00	29.80

February.—The early part cloudy and sultry, on 1st thermometer at 99° in the shade, exposed to the sun's rays 125°; middle fine, latter end cloudy; some rain fell on 8th, 14th, 27th and 28th; lightning and thunder on 14th, 18th and 26th. Winds S. W. and S. E.

Therm.	99	78	61	Barom.	30.20	30.00	29.80

March.—Fine till 6th, on which day there was lightning, thunder and some rain, thunder on 8th and 9th, much rain on 10th and 13th,

showery on 10th and 23d, squally on 15th, 19th and 29th, remainder fine. Winds N. E.—N. W.—S. S. W.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	94	73	54	Barom.	30.40	30.02½	29.65

April.—Was alternately cloudy and fine, it rained on 2d, 7th and 24th. Heavy squall on 2d, hoarfrost of a morning at latter end. Winds N. E. and N. W.

Therm.	88	67½	50	Barom.	30.40	30.17	29.95

May.—It rained on 2d, 3d, 4th (full moon), 5th, 8th, 9th, 10th, 19th (new moon), 20th to 25th and 31st ; heavy squalls on 10th from N. E. ; remainder fine. Winds N. E. and N. W.

Therm.	79	64¼	46	Barom.	30.42½	30.06¼	29.70

June.—Much rain fell in this month, it rained on 2d (full m oon), 3d 6th, 8th, 10th (last quarter of moon), 11th to 17th, 25th (full moon), to 30th ; heavy squalls on 2d, from S. W. also squalls with thunder and lightning on 15th, 16th, 29th and 30th. Winds N. E.—N. W. and S. W.

Therm.	72	58½	40	Barom.	30.50	29.95	29.40

July.—Was very wet—it rained on 1st, 2d (full moon), to 5th, 9th to 12th, 14th, 16th, 18th, 22d, 24th (first quarter of moon), 25th to 29th, and 31st ; hail on 3d ; heavy squalls from N. W. on 18th, thunder and lightning ; and thunder with heavy rains on 27th. Winds N. and N. W.

Therm.	70	59¼	47	Barom.	30.40	30.10	29.80

August.—Rain on 1st, 2d, 6th, 7th, 8th, 9th (last quarter of moon), 13th, 14th, 15th, 16th (new moon), 19th, 27th, 28th, 29th, 30th, (full moon) and 31st, a thunder storm with heavy rain on 6th, on morning of 9th, heavy squalls from N. W. with lightning, thunder, hail and rain. Winds S. W.—S. E. and N. E.

Therm.	74	58⅓	46	Barom.	30.45	30.07½	29.70

September.—Beginning fine, middle cloudy and showery, latter end fine, some rain fell on 7th (last quarter of moon), 9th, 10th, 13th, 18th, 20th ; (first quarter of moon), 21st, 24th and 30th ; thunder and lightning with heavy rains on 24th. Winds N. W. and S.W.

Therm.	78	60¾	50	Barom.	30.40	30.10	29.80

October.—Early part fine, middle cloudy and showery, latter alternately cloudy and fine, rain on 9th, 10th, 11th, 12th, 16th, 17th, 19th and 31st. Winds S. W.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	88	66½	51	Barom.	30.25	30.07½	29.90

November.—Early part generally fine, middle cloudy and showery, and also latter end; rain on 8th, 14th, 18th, 20th, 21 st, 23d, 24th, 26th, 27th (full moon), 28th and 29th; lightning on 14th, and lightning and thunder on 17th and 26th. Winds E. N. E. and S. W.

Therm.	91	70¾	54	Barom.	30.30	30.05	29.80

December.—Early part fine, middle cloudy and sultry, latter end fine; rain on 1st, 27th (full moon), 30th and 31st; lightning and thunder on 13th, 28th, 29th, 30th and 31st. Winds N.—N. E. and S. W.

Therm.	100	76	54	Barom.	30.30	30.05	29.80

The prevalent diseases of this year were catarrhs, hooping cough, and opthalmia; cases of fever, dysentery and rheumatism were also occasionally met with.

TABLE OF METEOROLOGICAL OBSERVATIONS.

Year 1830.	Thermometer. Max.	Med.	Min.	Barometer. Max.	Med.	Min.	No. of days on which any rain fell.	Quantity of rain.
January......	0	0	0	0	0	0	0	0.926
February......	0	0	0	0	0	0	0	0.394
March........	88	73½	58	30.30	30.05	29.80	3	0.729
April.........	87	68½	54	30.30	29.95	29.60	9	1.087
May..........	84	63¾	45	30.15	29.82½	29.50	13	6.385
June..........	70	55½	40	30.15	29.82½	29.50	7	2.653
July.	65	51⅛	34	30.20	29.91¼	29.62½	17	9.091
August..	76	57¼	38	30.35	30.07½	29.80	15	5.280
September....	80	59¾	44	30.40	30.15	29.90	5	1.634
October.......	78	62¾	46	30.35	30.02½	29.70	12	3.030
November	93	71¼	54	30.25	30.02½	29.80	6	0.928
December	103	81½	62	30.20	30.00	29.80	5	0.005
Year 1831.								32.142
January......	106	82¾	68	30.10	29.91¼	29.72¼	3	
February......	102	80½	62	30.20	30.02½	29.85	2	
March........	96	76¾	56	30 20	30.02½	29.85	2	
April.	98	72½	48	30.25	30.10	29.95	3	
May......	78	63½	44	30.40	30.15	29.70	10	
June..........	70	58	38	30.30	29.90	29.50	14	
July..	67	54¼	33	30.40	30.05	29.70	15	
August........	76	59¼	42	30.40	30.10	29.80	18	
September....	78	62¼	45	30.30	30.00	29.70	12	
October.......	79	63	48	30.40	30.07½	29.75	11	
November	95	69¾	54	30.15	29.90½	29.66	9	
December	96	76¼	60	30.25	30.07½	29.90	4	

Meteorological Observations, continued.

YEAR 1832.	THERMOMETER.			BAROMETER.			No. of days on which any rain fell.	Quantity of rain.
	Max.	Med.	Mi .	Max.	Med.	Min.		
January	99	76¼	61	30.10	29.95	29.80	2	
February......	106	78¾	60	30.10	29.97½	29.85	3	
March.........	95	77¾	62	30.20	29.90	29.60	5	
April.........	92	71	50	30.30	30.10	29.90	15	
May...........	77	61	46	30 50	30.00	29.50	17	
June..........	74	59	44	30.60	30.20	29.80	16	
July...........	70	55½	40	30.35	29.97½	29.60	14	
August........	79	59½	44	30.30	29.97½	29.65	10	
September....	76	61½	50	30.30	29.97½	29.65	15	
October.......	76	62¼	50	30.25	29.87½	29.50	14	
November.....	86	64½	52	30.40	30.10	29.80	9	
December.....	101	75	60	30.10	29.90	29.70	7	
YEAR 1833.								
January	99	77⅓	59	30.20	30.00	29.80	2	0.004
February......	99	78	61	30.20	30.00	29.80	4	0.090
March.........	94	73	54	30.40	30.02½	29 65	7	0.602
April.........	88	67½	50	30.40	30.17½	29.95	3	0.125
May...........	79	64¼	46	30.42½	30.06¼	29.70	15	4.025
June..........	72	58½	40	30.50	29.95	29.40	18	9.353
July...........	70	59¼	47	30.40	30.10	29.80	20	6.511
August.	74	58⅓	46	30.45	30.07½	29.70	16	3.744
September....	78	60¾	50	30.40	30.10	29.80	9	1.405
October.......	88	66½	51	30.25	30.07½	29 90	8	0.546
November.....	91	70¾	54	30.30	30.05	29.80	11	0.354
December	100	76	54	30.30	30.05	29.80	4	0.076
								26 925

TABLE OF DEATHS, MARRIAGES, AND BIBTHS, AT PERTH.

YEAR 1830.		YEA 1831.		YEAR 1832		YEAR 1833.	
DEATHS.		DEATHS.		DEATHS.		DEATHS.	
Disease.	*No.*	*Disease.*	*No.*	*Disease.*	*No.*	*Disease.*	*No.*
Fever	14	Fever	3	Dysentery	1	Fever	1
Scurvy	13	Scurvy	3	Apoplexy	1	Dysentery	2
Dysentery	10	Dysentery	4	Drowned	1	Apoplexy	1
Dropsy	3	Epilepsy	1	Hanged himself	1	Excessive drinking	1
Apoplexy	1	Disease of heart	1			Pneumonia	2
Marasmus	4	Apoplexy	1			Consumption	2
Drowned	3	Marasmus	2			Hooping cough	1
Consumption	1	Convulsions	1			Thrush	1
Excessive drinking	1	Drowned	7			Croup	1
		Excessive drinking	1			Childbed	1
						Tabes mesenterica	1
Total	50		24		4		14

Total marriages at Perth, from 1830 to 1833 inclusive................32
Total baptisms at do. from 1830 to 1833 do. 130

TABLE of DEATHS, MARRIAGES, and BIRTHS, at FREEMANTLE.

YEAR 1830.		YEAR 1831.		YEAR 1832.		YEAR 1833.	
DEATHS.		DEATHS.		DEATHS.		DEATHS.	
Disease.	*No.*	*Disease.*	*No.*	*Disease.*	*No.*	*Disease.*	*No.*
Dysentery	10	Scurvy	12	Apoplexy	2	Convulsions	2
Scurvy	10	Dysentery	3	Dysentery	1	Speared by natives	2
Consumption	1	Consumption	1	Scurvy	1		
Dropsy	1	Killed by natives	1	Consumption	1		
Childbed	2			Cancer in womb	1		
Killed by natives	1			Killed in a duel	1		
				Drowned	4		
				Hanged himself	1		
Total	25		17		12		4

Total marriages at Freemantle, from 1830 to 1833 inclusive..........21
Total baptisms at do. from 1830 to 1833 do. 24

I am indebted to the Rev. J. B. Wittenoom, the Colonial Chaplain, for the foregoing tables of deaths, marriages and births, which were copied from his Register. They will give some idea of the prevailing diseases and mortality for each year, with the gradual decrease of sickness as the colony advanced. These tables however can only be looked upon as an approximation to the truth, as in the early state of a new colony, it was difficult to obtain correct information in all cases. They include settlers, soldiers, women and children.

The Colonial hospital being at Perth, all the worst cases of disease amongst the poor were sent into it from all parts of the colony : consequently the deaths were more numerous there than at Freemantle.

IX.—*Account of the Construction and Operation of an Experimental Self-registering Barometer.*—*By* Wm. Gilchrist, *Esq. of the Madras Medical Establishment.*

In my communication respecting the Self-registering barometer published in No. 16 of the Journal, page 68, I mentioned with respect to the float which regulates the motion of the tube, that, "if this float " be sufficiently large to buoy up the tube, the balance part of the ap- " paratus may be laid aside altogether, and the weight below the cis- " tern, acting on the principle of *ballast*, will preserve the tube in the " perpendicular." I have fitted up a barometer on this principle. It has been in operation the last two days, and I have the pleasure to state that it proves most satisfactorily the correctness of the principle stated in the above quotation. I fear that a sketch of a plan of a barometer on this principle, could not be lithographed in time for the issue of No. 17, of the Journal now due, otherwise would send one. In the mean time, however, it will be satisfactory to those who wish well to the advancement of meteorology, to be informed that a barometer, of so simple a construction as the one alluded to, can be made, that will, with scientific correctness, make a perpetual record of the varying pressure of the atmosphere.

In fitting up the barometer referred to, I purposed merely to test the correctness of the principle, without reference to accuracy in the details of construction—in other words simply to ascertain whether the instrument would *work.* The tube portion consisted of a four-ounce glass stopper vial, by way of expanded top, cemented by means of bees' wax to a common barometer tube, the closed end of which was previously cut off. Presuming that those who interest themselves in meteorology would desire to test this principle, in the like easy manner, I will mention somewhat in detail the fitting up of the instrument, as otherwise one or two failures may occur before success be attained. In order to cement the vial and tube together, the mouth of the former and one end of the latter ought to be coated with melted wax—when cold, the tube is to be pushed about half an inch into the mouth of the vial and retained perpendicularly—then about four inches of the tube and one inch of the vial are to be coated with wax—applied in the fashion of paint—and when one is cold, successive coats are to be applied, until a body of wax has accumulated, sufficiently strong to keep the vial and tube firmly attached. It is essential to apply the wax coat after coat in the manner stated—as I found the applying it in the manner of *casting* did not make an air-tight joint. When the wax is

quite cold, this tube is to be fitted into a piece of wood, in which a groove is cut to receive it—the vial part being received into a sort of cup formed in the expanded upper part of the wood. To the lower end of this, the float (also consisting of wood turned on a lathe to the requisite size) is to be attached; and through the middle of it the glass tube must descend to a level with the lower end. The wood and glass are attached by means of wax, and it is necessary to coat the float with the same, to prevent the mercury entering the pores of the wood.

About a foot above the float a cross piece of wood was fixed horizontally, and from either end of this a wooden rod descends about four feet—these rods ought to admit of being easily and firmly attached to, or removed from, the rest of the apparatus. They support the wooden shelf on which to place the weights which act as *ballast*, and it ought to be broad to admit of moving the weights into the position that will cause the whole instrument to float perpendicularly. The vial ought to be filled with mercury before the tube is cemented to it—however, this is not essential, as the mercury can easily be introduced down the tube—care must be taken, however, to incline the tube as the mercury rises in this, otherwise the great hydrostatic pressure may burst the vial. The cistern which holds the mercury may easily be made out of a common beer bottle, by cutting off the top narrow portion with a red hot iron. The upper part of the float is considerably smaller than the lower, with the view to admit of the indications being magnified.

Compared hourly with a common barometer, the two rose and fell simultaneously, but not regularly. This of course arose from the unequal diameter of the vial, and the irregular contour of the float—it was intended that the indications should be magnified five times—but at some hours the indications were greater, at others less, than those dimensions—this irregularity of course arose from the cause just mentioned—but, as already stated, all I contemplated, was merely to ascertain whether a barometer on this principle will work, which was proved most satisfactorily.

This instrument, compared with the balance variety, recommends itself for its great comparative simplicity of construction.

The plan of bringing the centre of gravity below the float, would be advantageously introduced in the variety of barometer shown by fig. 2, plate 15, in the 14th Number of this Journal.

Hoonsoor, *5th October*, 1837.

X.—*Horary Meteorological Observations made at the Equinoxes and Solstices, agreeably with the suggestion of Sir* John Herschel.

1*st.—At the Trevandrum Observatory.—By* J. Caldecott, Esq.

Date.	Hour.	Bar. corrected for tempr. 32.	Thermometer	Depress of W. B. therm.	Dew point.	Direction of wind.	Velocity of do	Solar radtn.	Clouds, aspect of the sky and remarks.
Sept. 21	6 A. M.	29.978	74.0°	1.3°	71.73°	N N E ½ F	2.	—	Fl. cl. in zen.—light cum. about the horizon—fair—light air.
	7	29.993	75.5	1.0	74.09	do	1.	6.6	Zenith clear do do
	8	30.008	78.9	3.3	74.27	N N E	1.	4.5	do do do
	9	30.044	81.5	4.6	75.10	do	2.	9.6	Fl. light cls. in zen.—loose cum. about horizon.
	10	30.047	82 5	5.5	74.85	S W by W	2.	5.75	Heavy cum. dispersed—light air.
	11	30.029	83.5	7.0	73.68	S W	4.	4.65	do about N. & E. hor. gent. wind.
	Noon	30.001	84.5	7.8	73.57	S	5.	6.3	do do threatening—thunder from N.E,—heavy rain at half past twelve.
	1 P.M.	30.001	81.0	4.7	74.43	S by W	7.	Obscured.	Thunder and rain continued—squalls from S. by E.
	2	30.000	76.5	2.7	73.69	S E	4.		do. do.
	3	29.998	77.4	0.7	76.43	S S E	1.		Sky very cly.—wind hardly perceptible.
	4	29.992	77.9	1.9	75.25	do	4.		do. gentle wind.
	5	29.922	79.0	2.3	74.78	do	4.		do. do.
	6	29.929	77.7	2.1	74.76	do	4.		Sky hazy do.
	7	29.950	76.9	1.5	74.80	do	3.		Zenith clear—horizon very hazy —gentle breeze—lightng. in E.
	8	29.981	76.2	1.3	74.37	do	3.		do cls. and lightning about the N. W. and E. horizon.
	9	29.992	75.5	1.3	73.65	do	1.		do. wind hardly perceptible.
	10	30.007	75.6	1.3	73.76	do	2.		do. do. do.
	11	30.005	75.3	1.3	73.45	do	2.		do. do. do.
	Midn.	30.004	75.0	1.4	73.00	do	2.		Sky very hazy—lightning. N.
22	1 A.M	29.990	74.8	1.8	71.81	do	2.		Sky very cly.—wind just perceptible.
	2	29.976	74.5	1.5	72.34	do	2.		do. lightng. about S.E. horizon.
	3	29.959	74.0	1.7	71.53	do	2.		do. do. about E. horizon.
	4	29.954	74.0	1.8	71.38	do	2.		do. lightning from S. E.
	5	29 959	73.5	1.4	71.46	do	1.		Cum. and stratus dispersed—lightng. all round the horizon.
	6	29.979	73.8	1.2	71.97	do	1.		Overcast and threatening thunder from N. E.—wind hardly perceptible—rain at half past 6.
	7	29.998	74.0	0.9	72.70	do	2.	Obscured.	Rain continued--obscured--wind just perceptible.
	8	30.020	74,6	0.6	73.74	do	2.		Heavy cum. about the horizon—zenith very hazy—wind just perceptible.
	9								
	10	30.027	77.3	1.0	75.91	do	2.	2.4	do. do.
		30.028	80.0	4.3	73.96	do	1.	2.9	do. wind hardly perceptible.
	11	30.019	82,5	4.9	75.71	do	2.	3.1	Light cum. about the hor.—do.
	Noon	30.009	84.0	5.4	76.91	S by E	2.	7 8	Cum. dispersed in the zen.--wind just perceptible.
	1 P.M.	29.933	84.4	5.8	76.34	S by W	4.	9.6	Fl. cls. in zen.—cum. about the E. and N. horizon—thunder.
	2	29.932	82.9	5.5	75.27	S	4.		Sky very cloudy—gentle wind—drizzling rain and thunder.
	3	29.910	80.4	3.3	75.83	S	3.	Obscured.	do. threatng.—do.—thund. cont.
	4	29.926	80.5	3.5	75.65	S	3.		Nimbus in several parts—drizzling—thunder and lightning.
	5	29.927	80.5	3.7	75.37	S	4.		Lightning in the S. W. horizon.
	6	29.942	78.8	2.8	74.89	W	3.		do. do.

Fall of rain from 6 P. M. 20th to 6 A. M. 21st. . None.
do. 6 A. M. 21st to 6 P. M. 21st. . .7326
do. 6 P. M. 21st to 6 A. M. 22d . . .0042
do. 6 A. M. 22d to 6 P. M. 22d . . .1284
} Total in 36 hours .8652 inches.

Instruments the same, and are placed in the same situation, as described before.

2d.—At Hoonsoor, in Mysore.—By Wm. Gilchrist, *Esq. of the Madras Medical Establishment.*

Day.	Hour.	Dry thermometer Fahrenheit.	Wet thermometer.	Barometer.	Winds.	Clouds, &c.	Remarks.
Sept. 21	$6\frac{1}{4}$ A. M.	70	68	27.480	Calm	Zenith nearly clear—horizon cum-strati.	Heavy dew.
	7	71.75	68.5	.500	N. by E. light breeze	do. cumuli do. clear.	A rainbow on cloud near zenith.
	8	73.75	68.75	.520	N. E. by E. do	Thin cumuli and cirri over hemisphere.	
	9	76.25	69.5	.530	N. E. do	Cumuli over greater part of do.	
	10	78	69.5	.536	E. do	do. do. do.	The cumuli have ragged edges showing an electrical state.
	11	80.5	70	.536	N. E. do	Zenith cumuli—horizon all round cum-stra ti.	do. do. do.
	12	83	70	.510	E. by N. do	Detached large cumuli over hemisphere.	
	1 P. M.	86	71.5	.480	E. by N. breeze	do. do. do.	
	2	85	68	.462	do. do	do. do. do.	The cumuli ragged at edges.
	3	87	69.75	.444	E. do	do. do. do.	
	4	86.75	69	.424	E. by S. light do	Zenith detached cumuli. horizon cum-strati.	Cumuli as at 2.
	5	87	69	.414	N. E. breeze	do. do. do. do.	An upper and lower stratum of cloud; the latter highly electrical—rain to eastward.
	6	72.5	66.5	.424	S. W. light do	Nimbi.	$5\frac{1}{2}$ P. M. strong wind from E. with rain in large drops—6 P. M. wind suddenly changed to S. W. at first strong and puffy, afterwards light breeze.
	7	76.5	69	.414	Calm	Zenth clear—S. W. horizon nimbi.	7 P. M. lightning almost continuous in W. horizon—no thunder heard.
	8	74.5	69	.412	W. light breeze	Nimbi.	Heavy rain—thunder over head.
	9	74	70	.488	W. air	do.	
	10	74.5	70.5	.484	W. light breeze	Zenith clear—W. horizon dark cum-strati.	
	11	72	70	.464	W. air	do. do. a few cum-strati.	
	12	71	69.5	.470	W. do	do. do. do. do.	
22	1 A. M.	73.5	70	.484	W. do	Clear.	
	2	69.5	69	.462	W. do	Dense fog.	The fog supervened rather suddenly.
	3	69	68	.450	W. do	do.	
	4	68	67.5	.440	W. do	do.	

Day.	Hour.	Dry thermometer. Fahrenheit.	Wet thermometer.	Barometer.	Winds.	Clouds, &c.	Remarks.
Sept. 22	5	69	67	.450	Calm	Zenith clear, less fog around horizon.	
	6	70.25	68	.450	do	Fog.	
	7	71.5	67	.490	do	do.	
	8	70.25	68	.512	do	do.	
	9	74.5	70.5	.532	S. by E. light breeze	Zenith a few thin cumuli—horizon cum-strati.	
	10	76.5	71	.532	do do do	do. cumuli with ragged edges—horizon cum-strati.	
	11	79	72.5	.540	S. E. breeze	do. do. do. do. do	Shadow on horizontal plane 2.280 inches, the perpendicular wire being 6 inches long.
	12	81	70.5	.528	do do	do. do. do. do. do.	
	1 P. M.	82	69.5	.492	E. light breeze—puffy	do. do. do. do. do.	
	2	84	68.75	.462	N. E. do do	do. clear—horizon cum-strati.	do. 3.450 inches.
	3	84.75	69.5	.440	do do do	do. do. do.	
	4	84.5	67.5	.442	S. E. do do	do. do. do.	
	5	84.25	68.25	.436	N.E. do	do. do. do.	
	6	81.5	68.25	.406	Calm	do. cirri—do. do.	

Total quantity of rain during the period of observations 0.6 inch. The instruments with which the above observations were made, are the same as those used in June last, so that the remarks respecting their position, relative correctness, &c., as given with the June observations in the 16th No. of this Journal, apply equally to the above.

☞ The absence of the Astronomer from Madras has caused the omission of the Madras hourly observations.—Editor.

XI.—*Monthly Abstract of the Daily Atmospherical Register, kept at Merkara in Coorg, from* 1*st June* 1836 *to* 31*st May* 1837.

	Mean ther.		Mean barometer at 10 A. M. corrected.	Mean of hygrometer at 10 A. M.					Total fall of rain.	Prevailing winds.	General Remarks.
	At 6 A. M.	At 10 A.M.		Wet bulb.	Diff.	Quantity of moisture.	Dryness.	Dew point.			
1836 June	62	68	25.980	19.1	1.6	226.4	45	17.2	20.84	W. N.W.	The monsoon was later than usual on setting in, and can hardly be said to have begun till the 19th. The quantity of rain also does not amount to half the fall in the corresponding month of last year. For a considerable portion of the month, the air has been so saturated with moisture, as to afford no indication by the hygrometer. The troops continue (as usual at this season) very healthy.
July	62	64.6	26.025			Saturated.			23.73	W. N.W.	The monsoon has continued without intermission during the month, and the weather has been most disagreeable, exercise being almost totally precluded. The troops are very healthy, out of the 12 cases in hospital, 9 are accidents.
August	60	63	26.020			Do.			24.74	W. N. W.	The monsoon has continued without intermission throughout the month, with almost constant rain or fog, and high winds, the air being intensely damp and the sun scarcely ever visible. The troops continue extremely healthy.
Sept.	62	67	26.075	17.2	1.6	205.4	33	15.6	7.02	W. N. W. N. N. W.	The monsoon continued, but with diminished violence, when the weather cleared up, and has since been fine and clear with occasional fogs, and a few thunder storms. The wind is drawing gradually round the northward, and the nights are becoming cold. A few cases of rheumatism and fever, among natives have presented themselves, attended with determination to the head and chest—this is usual in all changes of weather.
October	63	68	26.125	16.1	6.1	149.4	129.6	8.7	0.55	NW. NE.	The weather during this month has been unusually fine, dry and clear, with high cold winds from the N. E. so much so as to occasion apprehensions of a deficiency of water for cultivation—The number of cases of slight fever, and rheumatism among the natives has also, as usual in sudden changes of weather, considerably increased—but they are generally mild, and yield to the usual simple remedies,

Nov.	60	70	26.120	15	7.2	128	151	5.4	1.55	E. NE.	The north-east monsoon may be said to have almost failed in this quarter. The weather during the month, except a few casual showers, has been clear, dry and cold. Fevers are becoming less frequent, and the troops are in general healthy.
Dec.	58	70	26.180	12.2	7.8	97.6	154.4	1.5	0.07	NE.	The weather during the whole of this month, with the exception of two light showers, and occasional fogs, has been dry and clear, the mornings and evenings cold, with, towards the latter part, storms of wind from the E. and N. E. The troops continue very healthy—a few cases of rheumatism and fever of a slight description notwithstanding.
1837. January	56	69	26.175	11.6	7.2	98.9	139.5	0.3	None	NE.	The weather during the past month has been uniformly clear, cold and dry, with very high cold winds. The number of cases of fever has somewhat increased, with a tendency in some instances to congestion in the lungs.
Feb.	60	74	26.210	15	8.8	112	188.4	2.5	None	E. E. N.E	The weather throughout this month has been intensely dry, and latterly very warm. The season being more than 6 weeks earlier than usual, the scanty monsoon of last year now begins to be severely felt, causing drought all over the country. The troops continue healthy.
March	64	76	26.170	16.4	8.9	124	197	4.6	1.29	Variable.	The weather during this month has been unusually close and hot, at least 6 weeks in advance of the two preceding seasons—water very scarce in many places. A considerable number of cases of fever, with determination to the chest, occurred after the showers on the 5th and 6th; since which the troops have been as usual healthy.
April	65	78	26.130	18.3	9.3	139	218	7.2	0.21	Do.	This month has been warm and pleasant; but few showers have fallen, which is unusual at this season.
May	63	72	26.070	20	4.1	211	93	16.2	7.64	N. W WN. W.	The early part of the month was warm and close with a few heavy showers. The monsoon set in on the 25th (unusually early) with a heavy thunder storm, but as yet only a small quantity of rain has fallen. As usual at this season, slight fever and bowel complaint have been common among the followers and prisoners in the jail, but have not prevailed among the military.
General means.	61.25	69.91	26.106				Total rain 87.04				

Robert Baikie,
Surgeon, 36th Regt. N. I.

XII.—Selections.

1.—*On a portion of Dukhun, East Indies.—By Lieutenant-Colonel* W. H. Sykes, F. R. S. F. G. S. F. L. S.

My personal observation of Dukhun (Deccan) and Konkun (Concan)* is not confined to the boundaries laid down in the following geological memoir; but as the rock and mineral specimens remaining at present in my possession are from Dukhun only, I have not thought it proper to extend my details beyond the limits I here prescribe to myself, although I might venture to do so from notes taken at different periods, without exposing my accuracy to question. I will, however, in closing this paper, offer a few observations on the trap and other formations of India; the amazing extent of the former not appearing to have been appreciated hitherto in European geological works.

Boundaries.—My tract† is bounded on the west by the range of mountains usually denominated by Europeans the "Ghats," from a misinterpretation of the term *ghat*, which simply means a pass, the proper name of this range being the "Syhadree;" on the north by the Mool river, as far as Rahooreh; on the east by a direct line from Rahooreh to the city of Ahmednuggur, and subsequently on the north-east by the Seena river until its junction with the Beema river below Mundroop; on the south-east by a line from Mundroop to the celebrated city of Beejapoor; on the south by a line from Beejapoor, to the town of Meeruj; and from this place the boundary in the south-west is the Kristna and Quina rivers, to the hill fort of Wassota, situated in the ghats. The western boundary line extends, as the crow flies, about 144 miles; the northern 72 miles; eastern and north-eastern 159 miles; south-eastern 41 miles; southern 80 miles; and south-western 88 miles. Agreeably to observations made by myself and the officers of the revenue survey in Dukhun, the tract lies between the parallels of north latitude 16° 45′ and 19° 27′, and east longitude 73° 30′ and 75° 53′, and, roughly calculated, may be said to comprise an area of about 26,000 square miles.

* With respect to the pronunciation of native words, the "*u*" is the *u* in "hut," and he "*a*" the *a* in "*all.*"

† See Map, Plate 7.

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NATURAL HISTORY

Stratification.—Previously to entering into descriptive details, I will state, in a few words, that the whole of the country comprised within my boundaries is composed of distinctly stratified trap rocks, without the intervention of the rocks of any other formation. Whether at the level of the sea, or at the elevation of 4500 feet, in all and every part, beds of basalt and amygdaloid are found alternating, whose superior and inferior planes preserve a striking parallelism to each other, and, as far as the eye can judge, to the horizon. Barometrical measurements and the course of rivers indicate a declination of the country to the east-south-east and south-east. From the town of Goreh, latitude 19°-03 and longitude 74°-05, on the Goreh river, following a mean course for the river until it falls into the Beema, and subsequently, continuing a mean course for the Beema until its junction with the Seena river, the distance is about 200 miles, and the declination 671 feet: there may therefore be a trifling dip of the strata; but as a succession of low terraces occur in that distance, the apparent horizontal position of the strata may be unaffected by the above difference of level.

Dr. MacCulloch, describing the over lying or trap rocks, says, " these masses are generally irregular, but sometimes bear indistinct marks of stratification."* As Dr. MacCulloch's language implies the *rare occurrence* of stratification, instead of its being a distinctive feature, at least of the Indian branch of the trap family, I deem it necessary to quote the few authors who have written on Indian geology, in confirmation of the fact I have stated.†

* Classification of Rocks, p. 466.

† " These mountains (the Vindhya range), like every other in Malwa, appear to be distinctly stratified, consisting of alternate, horizontal beds of basalt or trap and amygdaloid. Fourteen of these beds may in general be reckoned, the thinnest at the top, and rapidly increasing in thickness as they lower in position, the basalt stratum at the bottom being about 200 feet thick." Again, at page 327, he says : " In the upper plains of Malwa every point of view presents the same uniform and distinctly streaked appearance noticed in the Vindhya range."—*Captain Dangerfield, in Geological Notices of Malwa,* in Appendix No. 2. to Sir John Malcolm's Central India, pp. 322, 327.

Dr. Voysey, in a paper on the Geological and Mineralogical Structure of the vicinity of Nagpoor, says : " From the summit of the hill of Sitabaldi the difference in the outline of the rocks eastward is very perceptible. The *flattened summits* and *long flat outline*, with the numerous gaps of the trap hills, are exchanged for the ridgy, peaked, sharp outline of the primary rocks."—*Physical Class of the Asiatic Researches,* p. 127.

In a second paper in the same work, on some petrified shells in the Gawelghur range of trap mountains, extending for 165 miles along the left bank of the Tapty river, from its source to the city of Boorhanpoor, he describes the principal part of the range as formed of " compact basalt very much resembling that of the Giant's Causeway. It is found

Ghats.—The Dukhun rises, by a succession of terraces or steps, very abruptly from the Konkun.* Its valleys and table-lands have a mean elevation above the sea of about 1800 feet. The Konkun is a long strip of land from thirty to fifty miles in breadth, lying between the ghats and the sea; the mean elevation of this strip is less than one hundred feet; but it is bristled with isolated hills, or short ranges, some of which attain an elevation equalling that of the ghats. Numerous shoulders or salient angles are thrown out from the ghats from the western or Konkun side, and by means of these the ascent to Dukhun is effected; with what difficulty, will be understood when I state that the military road of communication between Bombay and Poona, up the Bore ghat, rises nearly six hundred feet in a mile. The western portion of my tract along the crest of the ghats is exceedingly strong: spurs of different lengths extend from the main range to the eastward and south-east, leaving many narrow tortuous valleys between them, some of which have the character of gigantic cracks or fissures; other valleys, although occurring less frequently, when looked at from the neighbouring ranges, appear as flat and smooth as a billiard-table, even to the crest of the ghats, but when traversed are found to be cut up by numerous narrow and deep ravines.† Stupendous scarps, fearful chasms, numerous waterfalls, dense forests, and perennial verdure, complete the majesty and romantic interest of the vicinity of the ghats. As the spurs extend to the east and south-east they diminish in height, until they disappear on approaching the open plains in my eastern limits, between the Beema and Seena rivers. The area of the table land on their summit often exceeds that of the valley between them: such is the case with the spur bordering the left bank of the Beema river for forty miles from its source, occupying, in fact, the whole country between the sources of the Beema and Goreh rivers. The spurs are rarely tabular for their whole length, but narrow occasionally into ridges capped with compact basalt, and subsequently expand into extensive table-lands. The spur originating in the hill fort of Hurreechundurghur affords a good example. The fort is about eighteen miles in circumference: on the east it presents a salient angle to the neighbouring mountain; absolute contact, however, only commences at about four hundred feet from the top of the scarp, leaving

"columnar in many places, and at Gawelghur it appears *stratified;* the summits of several "ravines presenting a continued stratum of many thousand yards in length."—*Physical Class of the Asiatic Researches*, p. 189.

* See Plate 9.

† The valley of the Malsej ghat, for instance.

* See plate 9, fig. 1 and 2 on the Konkun ; and Plate 8, fig. 1.
† Physical Class, Asiatic Researches, p. 189.

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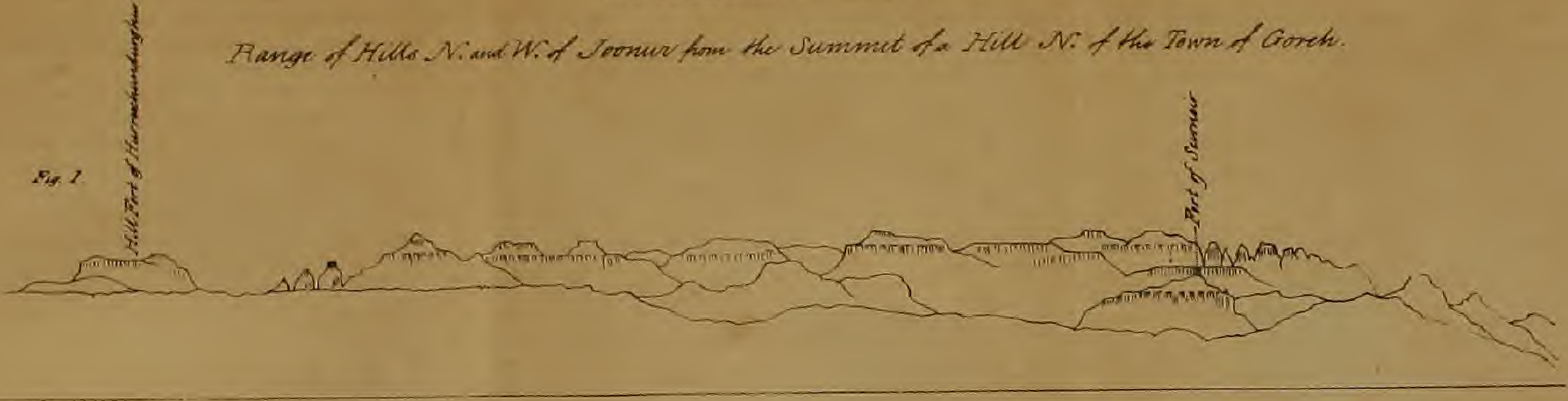
PANORAMIC SKETCHES.

Range of Hills N. and W. of Joonur from the Summit of a Hill N. of the Town of Goreh.

Fig. 1.



N. & E. Range of Hills as seen from Lakungaow in the Valley of Joonur.

Fig. 2.

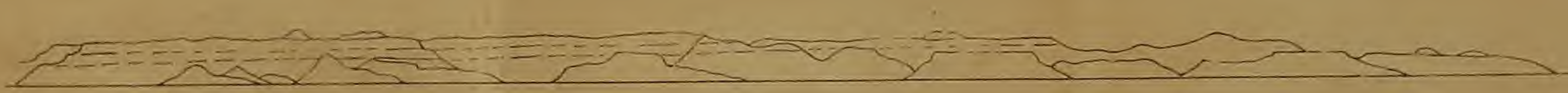
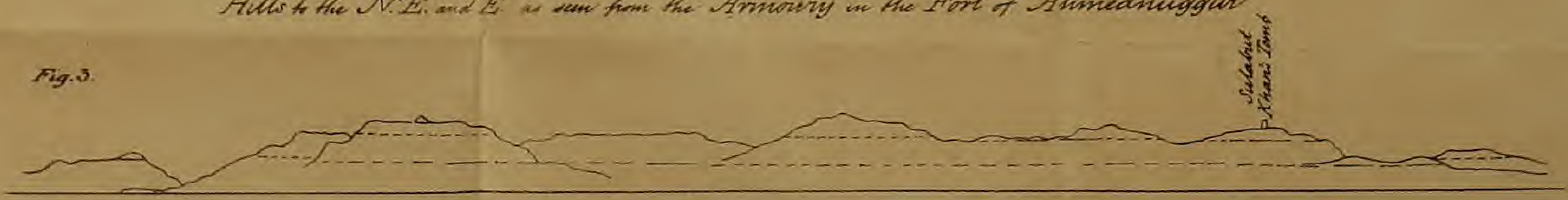


Fig. 2. Continued from the N. to the W.

*Fig. 2**

Hills to the N.E. and E. as seen from the Armoury in the Fort of Ahmednuggur

Fig. 3.



Northern Flank of the Plateau on which the City of Ahmednuggur Stands as seen from Wamooree.

Fig. 4.

a gap and an extremely narrow ridge, over which lies a difficult foot-path of communication between the valley of the Malsej ghat and that of the Mool river. The spur then widens; some lateral ramifications shoot out, on one of which is situated the fort of Koonjurghur ; at the Brahmun Wareh pass it narrows considerably, but not into a ridge ; it subsequently expands into the extensive and well-peopled table-land of Kanoor and Parneir, twenty-four miles long by twenty broad, having diminished in height, by a succession of steps, from 3894 feet in Hurreechundurghur to 2866 at Brahmun Wareh, 2474 at Parneir, and 2133 on the terrace of Ahmednuggur. From Ahmednuggur the spur bends southward until it is finally lost in the neighbourhood of Sholapoor. It is, in fact, the margin of a great plateau, which has a mean elevation of about three hundred feet above the valley of the Godavery river, and over which the rivers Goreh, Beema, Seena, &c., take their course. The basaltic caps of the ridges appear more or less columnar, from numerous vertical fissures ; the weathering of these exposed rocks produces pillars, spires, towers, houses, and other forms of works of art.* Another feature of these spurs is the occasional occurence on their table-lands of small hummocks or conical hills with a truncated apex. Dr. Voysey† mentions "groups of flattened summits and isolated conoidal frustra" in the Gawelghur trap mountains.

One of the longest of the spurs originates in the ghats north-west of Satarah, and runs nearly east-south-east, about one hundred and ten miles, towards Punderpoor.

The spur immediately south of Poona, on the ramifications of which are situated the formidable fortresses of Singhur (4162 feet), Poorundhur (4472 feet), and Wuzeerghur, adjoining Poorundhur (at nearly the same elevation), has an extent of ninety-five miles. The accompanying section, Plate xxviii. fig. 2. represents this spur.

Valleys.—Much having been said respecting valleys of excavation, I think it may be acceptable to offer a few observations on the valleys between the spurs. I shall describe only those that present the greatest contrasts to each other.

Valley of the Mota river.—The valley of the Mota river, south of Poona, originating in a mass of hills on the edge of the ghats, is so exceedingly narrow, that for some miles the bases of the opposite hills

* See plate 9, fig. 1 and 2 on the Konkun ; and Plate 8, fig. 1.

† Physical Class, Asiatic Researches, p. 189.

frequently touch each other, leaving, at intervals, little horizontal plots, of a pistol-shot in width. These plots occur in terraces, on lower levels as they extend eastward.

Vale of the Under.—The valley of the Under river, north-west of Poona, presents a perfect contrast to the last. It is level for twenty miles, running east and west to the very edge of the ghats, and a person can stand at the head of the valley upon the brink of a scarp rising almost from the Konkun. Here, at the source of the river, it is nearly six miles wide. The river Under runs down the valley one hundred and fifty feet below the level of the cultivated lands.

Vale of the Baum.—The neighbouring valley of the Baum river, unlike that of the Under, originates about seven miles from the crest of the ghats at a spot where the mountain masses separate into two spurs. Hence it continues level for fourteen miles, gradually widening eastward. The Baum river, like the Under, runs at a level of one hundred and fifty feet below the cultivated lands; these lands, in fact, being upon one terrace, the river upon a second and lower terrace.

Vale of the Beema.—The next valley on the north is that of the Beema river. The river rises on the elevated table-land above the ghats, at three thousand and ninety feet, and within the first few miles it tumbles over several terraces. The valley, for eighteen miles, is occasionally as narrow as that of the Mota river.

Vale of the Goreh.—Next on the north occurs the valley of the Goreh river, which, from the source of the river to Munchur (twenty-nine miles), is exceedingly narrow and tortuous. Here it expands into the broad horizontal plain of Kowta, ten miles wide.

Vale of the Malsej Ghat.—In conclusion, as a contrast to the first part of the Goreh valley, I must mention the valley of the Malsej ghat, on the south of the Dukhun-base of the fort of Hurreechundurghur. It is several miles wide, and literally as level, even to the brink of the ghats, as if smoothed by art. Many of the valleys of the ghats, particularly that of the Mool river, from the continued scarped character of the marginal mountains, and the flatness of the bottom for miles in extent, look like fosses to a Titan's fortress.

If all these valleys be valleys of excavation, the present rivers could scarcely produce such, were we to suppose their powers of attrition in operation from the origin of things even to the end of time!

Those of a fissure-like character might have resulted from the upheaving of the beds of trap from below the sea, and the consequent probable fracture of the surface ; but the same explanation will not apply to those valleys associated with the preceding, broad, flat, and margined by scarped mountains, which valleys are as wide at their origin at the crest of the ghats, and at the sources of the rivers which run through them, as in any part of their length.

Terraces.—As the rise from the Konkun to the Dukhun is by terraces, so the declination of the country eastward from the ghats is by terraces; but these occur at much longer intervals, are much lower, particularly in the eastern parts, and escape the eye of the casual observer. In the neighbourhood of Munchur, on the Goreh river, there are five terraces rising above each other from the east to the west, so distinctly marked, that the parallelism of their planes, to each other and to the horizon, gives them the appearance of being artificial. An artificial character also pervades the form of many insulated hills : some of which viewed laterally, appear to have an extensive table-land on the summit, but seen endways look like truncated cones. Conoidal frustra in the Gawelghur range have been already noticed. Other insulated hills are triangular in their superficial planes, as the forts of Teekoneh(three-cornered) and Loghur.

Escarpments.—Stupendous escarpments are occasionally met with in the ghats. In these instances the numerous strata, instead of being arranged in steps, form a continuous wall. At the Ahopeh pass, at the source of the Goreh river, the wall or scarp is fully one thousand and five hundred feet high ;* indeed, on the north-west face of the hill fort of Hurreechundurghur, the escarpment can scarcely be less than double that height. On the other hand, the steps are sometimes effaced, and a hill has a rapid slope. This originates in a succession of beds of the softer amygdaloids, without any basaltic interstratification ; their superior angles disintegrate, and a slope results. But most usually three or four beds of amygdaloid are found between two strata of compact basalt ; the former disintegrates, leaving a slope, which is not unfrequently covered with forest trees, forming a picturesque belt : the basaltic scarp remains entire, or it may be partially buried by the debris

* Plate 9, fig 1.

from the amygdaloids above; but its great thickness usually preserves it from obliteration, and it rises from the wood below with majestic effect, its black front being finely contrasted with the rich and lively green of its sylvan associate. It is these strata, arranged in slopes and scarps repeated three or four times, and so commonly met with in insulated and other mountains in Dukhun, that constitute the amazing strength of the hill forts of the country, leaving a succession of natural walls encircling a mountain. This feature did not escape the observation of Captain Dangerfield in Malwa, who says, "From the great difference in the resistance made to decomposition by these trap and amygdaloid beds, their exposed ends acquire a very distinct degree of inclination and character; the amygdaloid forming a great slope, and affording a loose mould covered with vegetation, the trap retaining its original perpendicularity and dark bareness."*

In the alternation of the strata there does not appear to be any uniformity; but the general level, thickness, and extent of a stratum are preserved, as in sedimentary rocks, on both sides of a valley; the basalt and hardest amygdaloids being traceable for miles in the parallel spurs or ranges; but the imbedded minerals, and even the texture, vary in very short distances.

Columnar Basalt.—A great geological feature of Dukhun is the occurrence of columnar basalt. The basalts and hardest amygdaloids run so much into each other that the line of separation is not always readily distinguishable, excepting of course the lines of horizontal stratification. I observed the prismatic disposition more marked and perfect in the basalt strata than in the amygdaloids, and the more or less perfect development of determinate forms was dependent on the compactness and limited constituents of the rocks. Basalts and amygdaloids, however compact, with many imbedded matters, rarely formed columns. Perfect columns were generally small, of four, five, or six sides; but the prismatic structure sometimes manifested itself in basaltic and amygdaloidal columns many feet in diameter. A bare mention of the places where they occur will testify to their extended localities.

On the low table-land of Kurdah, near Serroor, between sixty and seventy miles east from the ghats, columnar basalt occupies an area of many square miles. Small columns are seen in most of the slopes of the very narrow sinuous valleys of the flanks of the platform, and

* Malcolm's Central India, Appendix, p. 322.

frequently the tops or terminal planes of columns are observed on the table-land forming a pavement. The perfect columns in the flanks are generally small, four, five, or six-sided, and rest on a stratum of basalt or amygdaloid. In some spots the columns are articulated, in others not. In a mass of columns in the face of the table-land towards Serroor the columns are of different lengths, but spring from the same level. More articulations having been washed from the outer columns than from the inner by monsoon torrents dashing over them, a pretty flight of steps remains. The columns of this table-land are from the most part erect, but sometimes stand at various angles, to the horizon, usually at 45°. In one instance, near the village of Kurdah, they lean from the east and west, towards a central upright mass: these are about fourteen feet in length, and are not articulated. In a mass of columns facing the west, and two miles south of the cavalry lines at Serroor, some are bent and not articulated; they are nevertheless associated with straight columns, which are articulated. At Karkullah thirty miles north-west of Poona, between Tellegaon and Loghur, a hill has been scarped for the great military road. Very numerous small columns occur in the escarpment, and they lie piled upon each other in a horizontal position; the only instance of the kind within my knowledge in Dukhun. Two or three hundred yards west of the village of Yewtee Purgunnah Kurdeh, in the rocky banks of a rivulet, imperfect columns are seen. On the right bank they are so marked, as to have excited the attention of the natives (an unusual event); and they are daubed with red lead, in the manner of Hindoo deities, and venerated.

At Kothool, twenty-two miles south of Ahmednuggur, there is a thick stratum of close-grained gray homogeneous basalt in the face of the hill on which is seated the temple of Kundobah. Vertical and horizontal fissures are seen in the lateral plane or exposed edge of this stratum, but they are so far from each other as to leave huge blocks between them, giving the appearance of the superstratum of the hill being supported by massive articulated pilasters. Parts of the exposed edge are detached from its mass, leaving rude columns four or five feet in diameter, eight or ten high, and composed of three or four weighty stones disposed to assume geometrical forms. In the water-courses near Kurroos Turruf Ranjungaon, columns are observable. The basalt is bluish gray, compact, has a vitreous hue, and sharp fracture. The columns occur very abundantly in the slope of the hills, on either side of a very narrow valley running westward from the village of Ankoolner, Ahmednuggur collectorate. They are five

or six-sided, articulated, and from a foot to two feet and a half in diameter, and of various lengths; the lateral planes perfect, but in some instances the sharpness of the angles has been affected by weathering. The texture is close-grained, colour almost black, and they affect the needle.

At Jehoor, near the source of the Seena river, in an insulated hill, an obscure columnar disposition is met with in a rock, in which in other places I had not seen the slightest trace of it. A stratum of red, cellular, amygdaloid fifteen feet thick, has subcolumns in its exposed edges eight or ten feet in diameter. In the banks of a water-course running into the Hunga river, half a mile east of Parneir, on the elevated table-land between the cities of Ahmednuggur and Joonur, basaltic columns are very numerous, they are five or six feet high, not articulated, and are not quite perpendicular. This formation is evidently extensive, as the ends of columns, chiefly pentangular, appear in the bed of the water-course for some distance, forming a pavement of geometrical slabs. The ends of columns of different lengths also appear in the southern bank at intervals, forming flights of steps. The basalt of which these columns are composed is very close-grained, almost black, with shining specks of a metallic lustre. The rocky banks of the Kokree river at Jambut, in the plain of Joonur, exhibit a strong inclination to a large columnar structure. In the hill fort of Singhur, at an elevation of 4162 feet, at the western end of the fort, there is a sheet of rock which has the appearance of a pavement of pentangular slabs. The slabs are no doubt the terminal planes of basaltic columns. The same is observed in the hill fort of Hurreechundurghur, about seventy miles north of Singhur; also in the bed of a water-course one mile north-east of Barlonee, near the fortress of Purrunda, 112 miles east-south-east of Singhur; and, lastly, in the bed of the Mool river at Gorgaon, Poona collectorate. These pavements extend to Malwa, as Captain Dangerfield mentions their occurrence in the beds of the Chumbul and Nerbuddah (Nermada) rivers.* The other localities of basaltic columns, or a marked disposition to this structure, were in a well at Kumlepoor, between the fortress of Purrunda and Barlonee, near the left bank of the Seena river; at Kheir Turruf Rasseen, in the face of a headland, abutting on the Beema river, on which the town stands; in the ascent to the temple of Boleshwur Turruf Sandus, Poona collectorate; and, finally,

* Malcolm's Central India, Appendix, pp. 329, 330.

in the scarps of a mountain running down into the Konkun, and seen from the Naneh ghat, about three miles distant. Here the Giant's Causeway in Ireland is brought to mind ; but the scale of the mountain is infinitely more magnificent, being fully 4000 feet high. There is a double row of columns, but from their inaccessible situation, I could only examine them through my telescope, and cannot testify, therefore, to their perfect development.

Captain Dangerfield only once speaks of columns. They lie about a mile from the Nerbudda(Nermada), between Mundleysir and Mhysir, at 696 feet above the sea : they are either vertical or highly inclined. General Hardwick has published a lithographic sketch of them.* I have already stated that Dr. Voysey found columnar basalt in many places in the Gawelghur range.

Schistose structure.—Following the preceding formation, I may mention, that in some few places a schistose structure was met with; but its extent was limited to a few yards, the lamellæ were vertical, from an inch to three inches in thickness, being perfect tables, with parallel bounding planes. The rock in which this structure occurs, is a simple, indurated, gray clay, which flies into fragments under slight blows from the hammer. At Dytneh near Serroor some very perfect specimens have led the inhabitants to connect mystic influences with so artificial a development of inorganic matter. The spot is daubed with oil and red lead, and venerated.

Basalt en boules.—Another characteristic feature is the general diffusion of those rounded or oval masses of compact basalt, with concentric layers like the coats of an union, which the French geologists denominate "Basalt en boules," and ourselves, nodular basalt.

These concretions are usually found at the base of hills, buried in the debris from the decomposing strata ; but in the Konkun, between Choke and Campolee (the latter at the foot of the Bore ghat), two villages on the high road between Bombay and Poona, I met with them lying on the surface over a considerable area. They occur in a similar manner on the table-land of the ball-practice hill at Poona. At Koothool (already mentioned), in the slope of the hill, and in the debris at its base, and along the edge of the table-land near Paubul, they are abundant; but the finest specimens are seen near the village of Karkullah, thirty miles north-west of Poona, associated with hori-

* Malcolm's Central India, Appendix, p. 323.

zontal basaltic columns. The hill has been cut away, to form the great military road. In making the escarpment, the balls were met with, and it being impossible to cut through the nuclei in vertical sections, it was either necessary to leave them projecting or to remove them altogether: in the latter case cavities remained equal to the hemispheres of the nuclei; and the vertical sections display from ten to fifteen concentric layers of friable gray stone, which in some instances I have found to affect the needle. I compared specimens of the nuclei with a mass brought by me from the Solfatara at Naples, and found them quite similar in aspect, colour, hardness, and great weight. This formation excited the attention of those gentlemen who have visited the northern and eastern parts of the great trap region;* but Dr. Voysey was quite mistaken in supposing it formed the basis of the western ghats. Captain Coulthard speaks of it in Sagar†. Major Franklin also noticed it in the trap of Sagar, in lat. 23° 51′, and long. 78° 44′, at 1933 feet above the sea, as "frequently globular; the nuclei "of the decaying masses, varying in size from an egg to a large bomb-"shell, and their decomposing concentric lamellæ being generally "very thin, and often very numerous."‡

Dykes.—I now pass to the basaltic dykes, several of which came to my notice in different parts of the country. They are all vertical, and I did not observe that they occasioned any disturbance or dislocation in the strata of basalt and amygdaloid, through which they passed.

Two dykes run obliquely across the valley of Karleh (thirty-five miles north-west of Poona), and intersect each other: they are about four feet thick and cut amygdaloidal strata. A prismatic disposition is

* Dr. Voysey says, "The nodular wacken or basalt is one of the most common forms "of trap in the extensive districts composed of the rocks of the family south of the "Nermada (Nerbuddah) river. It occurs perpetually in the extensive and lofty range of "mountains (the Gawalghur), situated between the Purna and Tapti rivers, and appears "to form their principal mass. It is found equally abundant throughout the whole of "Berar, part of the provinces of Hyderabad, Beder, and Sholapoor, and appears to form "the basis of the great western range of trap hills which separate the Konkun from the "interior of the Dukhun."—*Physical Class, Asiatic Researches*, pp. 126, 189.

† "The base of the hills is invariably broader than the summit; and if the sides of a "hill are smooth and even, *balled* trap, often a concentric lamellar variety will be the "principal component matter, decomposing and decomposed into a predominating work-"able clay, still showing the parallel converging layers."—*Physical Class, Asiatic Researches*, p. 78.

‡ Physical Class, Asiatic Researches, p. 30.

generally observable in the fracture, and from one of them I obtained a square prism, which lay at right angles to the walls of the dyke. The texture is compact. The military road running through this valley and down the Bore ghat to Panwell, is frequently crossed by ridges which I presume to be the outcrops of dykes. A dyke is seen on the southern slope of an insulated hill, near the villages of Bosree and Digghee, seven and a half miles north of Poona*. It is about four feet thick, has a transverse prismatic fracture, is compact, and runs from the bottom to the top of the hill ; but it is not discoverable in the northern slope. It is visible from the cantonments at Poona. A similar dyke occurs in the hill at Ombreh, twenty miles north-north-west of Poona. But the most remarkable dyke runs vertically, from east to west, through the hill fort of Hurreechundurghur. It is first seen, of a thickness of six or seven feet, in the ascent of the mountain on the south-east from Keereshwur, about four-hundred feet below the crest of the scarp. The path of ascent into the fort is intersected by it, and its prismatic fracture, at right angles to its planes, offers a few available steps in the ascent. It is traceable for about three-hundred feet in perpendicular height. On the top of a mountain, within the fort, about a mile to the westward, it is discoverable at intervals, cutting through basaltic and amygdaloidal strata. I could not ascertain whether or not it appears in the western scarp of the mountain, the point to which it directs its course being wholly inaccessible.

The gentlemen whose geological memoirs I have quoted, rarely advert to the subject of trap dykes, and their notices are very brief. Capt. Dangerfield says, " The trap of the southern boundary of Malwa " is much intersected by vertical veins of quartz, or narrow seams of a " more compact heavy basalt, which appears to radiate from cen- " tres."† Beyond the continuous trap region of the peninsula, Dr. Voysey notices a basaltic vein in sienite, near the Cavary river at Seringapatam, which must have been propelled upwards, as it broke through an oblique seam of hornblende in the sienite, and carried the pieces up above the level of the hornblende vein‡. " On the eastern coast," Mr. Calder says, " from Condapilli northward, the granite is " often penetrated and apparently heaved up by injected veins or " masses of trap, and dykes of greenstone."§

* See Plate xxxiii. fig. 1. † Malcolm's Central India, Appendix, p. 330.

‡ Physical Class, Asiatic Researches, part1. p. 22. § Ibid, part I. p. 10.

Ferruginous Clay.—The next distinctive feature is the occurrence of strata of red ochreous rock, in fact, MacCulloch's ferruginous clay underlying thick strata of basalt or amygdaloid, precisely as is seen to be the case in the Giant's Causeway in Ireland. It passes through every variety of texture, from pulverulent, friable, and indurated, to compact earthy jasper. The stratum is from an inch in thickness to many feet. The rock makes a red streak on paper, with the exception of the very indurated kinds, and does not affect the needle. It is pulverulent near the basaltic columns at Serroor, friable under sub-columnar red amygdaloid, near the source of the Seena river, indurated under basalt at Kothool. Although hard, it is here so cellular as to have the appearance of sponge, and reduced to powder, looks like brickdust.

In the scarps of the hill fort of Hurreechundurghur and a mountain near Joonur in which are excavated numerous Boodh cave temples, it is found compact and homogeneous, and is, in fact, an earthy jasper. In these localities it lies under from three-hundred to six-hundred feet of basalt. In the former locality it is about three feet thick, in the latter one foot. At Nandoor, north-north-west of Ahmednuggur, in the valley of the Godavery river, it is found as a porphyritic stratum, many feet in thickness, and is used as a building stone. The imbedded matter consists of very minute crytsals of lime. At Wangee, lying nearly in the latitude of Barlonee, but differing 18 miles in longitude, and at Barlonee it occurs as an earth : as both places lie on the same level, I have no doubt the stratum is continuous between them. It occurs abundantly in the ghats, frequently discolouring the rivulets, and giving a ferruginous character to the soil over a considerable area. When thin, andunder heavy beds of basalt or amygdaloid, the exposed edge of the stratum projects, is rounded, and double the thickness of the stratum itself ; as if it had once been in a tenacious fluid state, and squeezed out by the superincumbent basalt ; such is the case at Jehoor.

Pulverulent Limestone.—Limestone is met with, in the Dukhun, only in three states : pulverulent, nodular, and crystalline. The first occurs in thin seams on the banks of rivers and water-courses and at the base of hills in debris. The seams are from an inch to three feet in thickness, covered by a few feet of black earth. Sometimes in whiteness it resembles pounded chalk, and is then used by children to smear their writing boards.

In this state it occurs at Jehoor and Islampoor near Ahmednuggur.

At Kurkumb and at Salseh ten miles south of the fortress of Kurmaleh, it is met with under black earth in unusually thick strata, and of a peculiar whiteness. Major Franklin notices " a stratum of earthy limestone, white as chalk, at Sagar, occurring under a stratum of amorphous trap."*

Nodular Limestone.—The nodular limestone, which is the well-known kunkur† of India (*kunkur* being a native word for nodule), occurs, like the preceding, disseminated or diffused in the soil, and also on the surface. I have never seen the nodules of a regular crystalline form. They vary in size from a marble to a twelve-pound shot, and many of them are exceedingly irregular in shape, particularly those dug from the banks of rivers. They are sometimes obscurely lenticular. They are so abundant in certain localities that they appear as if showered upon the earth, and disguise its colour. Dr. Buchanan mentions the same in Rajmahl. When upon black soil, they are usually minute and tolerably uniform in size: on other soils their form is variable. In the ghats neither pulverulent nor nodular lime is met with. It is unnecessary to particularize the localities of the nodular kind, as it is of common occurrence eastward from the hilly tracts of the ghats, and is the only source of lime for mortar, a class of persons making a livelihood by collecting the larger nodules. When carefully burnt, they make an excellent cement. Captain Dangerfield describes, " the occurrence (in Malwa) in some parts, particularly near the bottom of the small hills, and banks of the rivulets, of a thin bed of loose marl or coarse earthy limestone."‡

Captain Coulthard says, " In Sagar a white patch of this limestone " mouldering by the weather is the source from whence comes the " particles of kunkur, mixed with the black basaltic earth of the neighbouring valley in such proportion as to add increased fertility to it; " and if a rivulet meanders through that valley (and such is generally " the fact) patches made up of aggregated particles of the same, will " here and there be found; and this it is which the native families pick " out and work into lime."§ Captain Coulthard refers the origin of the nodules to limestone rock underlying basaltic strata, but I cannot trace them to such a source, not having seen strata of compact lime-

* Physical Class, Asiatic Researches, part I, p. 30.

† The Mahratta word is not spelt with an " a." ‡ Malcolm's Central India, p. 328.

§ " Trap of the Sagar District," Physical Class, Asiatic Researches, p. 60.

stone, properly so called, in the Dukhun. The only specimen of compact limestone met with by me was in the bed of the Beema river near Pundurpoor. It was an insulated, amorphous, gray mass, four or five feet in diameter. I looked upon it as an aggregation of the pulverulent particles of the lime disseminated in the neighbouring banks.

Crystalline Limestone.—Lime in a crystalline state occurs only as an imbedded mineral in the amygdaloidal strata, in quartz geodes, and in the nucleus or compact part of masses of mesotype or stilbite. It is rare, compared with the preceding varieties.

Loose Stones.—Another feature of Dukhun is the occurrence of immense quantities of loose basalt stones, as if showered upon the land; also masses of rock heaped and piled into mounds, as if by the labour of man. Their partial distribution is not less remarkable than their abundance. For the most part, the stones have a disposition to a geometrical form, and it is by no means rare to meet with prisms of three or four sides and cubes almost perfect: stones with one or two perfect planes are very common. Their texture is close-grained and the colour verging to black.

At Dehwuree, Hungawaree, Behloondee, Kothool, and Dytneh in the Ahmednuggur collectorate, they are very abundant. At the last place they cover fields several acres in extent, so thickly that the black fertile soil on which they rest is not discoverable: they vary from an ounce to several pounds in weight. Amongst these I picked up a perfect square prism. In neighbouring fields, most unaccountably, there is not a stone to be seen: patches of sheet rock occur in their vicinity. Other localities are the top of the Neem Durra Ghat near Ahmednuggur; the junction of the Beema and Seena rivers below Mundroop; right bank of the Seena at Kurmaleh; between Kurjut and Meerujgaon; and generally it may be stated that the precipitous slopes of the low table-lands of the Desh (open or flat country) are very strong and rocky. For ten miles between Jeetee and Soagaon, Ahmednuggur collectorate, the fields, and even the road, are so thickly strewn with large basalt stones as to render cultivation difficult and travelling penible.

Rocky Heaps.—The singular heaps of rocks and stones above noticed occur at Kanoor, Patus, Kheir, between Kurjut and Meerujgaon, and at other places in the Desh, but not in the Mawals, or hilly tracts

of the ghats. The heaps are from twenty to seventy feet in diameter, and the same in height: when composed of rocky masses without small stones, blocks of three or four feet in diameter and with a disposition to determinate forms, are piled upon each other, constituting rude pillars. In certain parts of the country from fifty to sixty of these heaps are seen within the area of a couple of square miles, and it excites surprise that the intermediate ground is destitute of stones.

Sheets of Rock.—Mention must not be omitted of the constant recurrence of sheets of rock of considerable extent at the surface and totally destitute of soil: this is particularly the case in the Mawals, or hilly tracts along the ghats. They abound with narrow vertical veins of quartz and chalcedony. When of sufficient thickness, the vein splits in the centre parallel to the surface of its walls, the interior being drusy with quartz crystals: the walls consist of layers of chalcedony, cachalong, hornstone, and semi-opal. These veins supply the majority of the siliceous minerals so abundantly strewed over Dukhun.

The localities where the sheets of rocks particularly struck me were Lakungaon, on the plain of Joonur, and generally in the valley of the Goreh river; at Kothool, Pergunneh Kurdeh; at Kheir and Raseen; in the hill fort of Hurreechundurghur; most markedly between Kooldurrun and Pairgaon on the Beema river. At Aklapoor, on the Mool river, they were very extensive; and at Angur, Mohol, Kurjut, and Patkool. Generally in the eastern and south-eastern parts of my tract, much decomposing amygdaloid is found at the surface of the low table-lands or terraces, which, in favourable monsoons, is equal to the support of Jowaree*; but a small deficiency in the rains occasions the destruction of the crop.

Structure and Mineral Composition of the Trap Rocks.—The structure and mineral composition of the trap rocks in Dukhun vary exceedingly in short distances, even in the same stratum; nevertheless, the predominant character does not disappear, although the basalt in a continuous bed may pass several times from close-grained, compact, and almost black, to gray, amygdaloidal, and external decomposing. The same observation applies to the amygdaloids. A variety of compact basalt, of an intense green colour, is susceptible of a brilliant polish, and rivals the celebrated Egyptian kind. It is of great weight and remarkable hardness: the natives use it to work into idols for their

* *Andropogon Sorghum.*

temples, pedestals to the wooden columns in their mansions, and slabs for inscriptions. The bulls of the size of life, always placed before temples of Mahadeo, are cut out of this variety at Raseen, Wurwund, and the renowned Boleshwur. Some of the pedestals in the gateway of the Mankeswur palace at Teimboornee look like mirrors. In the temple at Pooluj, south of Punderpoor, there is a slab six or seven feet long and two and a half broad, covered with an inscription in the Kanree language; and in Punderpoor the streets are paved apparently with the same basalt. At Jehoor and near Ahmednuggur is found a compact kind like the last, but not so heavy. It has a crystalline character and sharp fracture, and has angular siliceous pebbles imbedded: an occasional pebble is loose in its cell. In the Happy Valley near Ahmednuggur the basalt is compact and smooth, with reddish flat transparent crystals imbedded. It opposes a feeble resistance to the hammer, and flies into fragments, some of which have right angles. The basalt, even of the true columns, is not of a uniform texture in different localities: at times it is blackish or gray, and very small, granular or compact; at others, earthy and ferruginous, particularly externally. The basis of the amygdaloids is clay, with more or less hornblende disseminated: they embrace the cellular, porphyritic, hard, friable, and decomposing. I endeavoured to class them agreeably to the prevalence of quartz, chalcedony, lime, mesotype, or stilbite, as imbedded minerals, but found the method of very limited application. Sometimes one mineral only is imbedded, occasionally two, and often the whole.

In Hurreechundurghur quartz amygdaloid prevails: at Aklapoor on the Mool river it is characterized by mesotype, that mineral being imbedded in large masses, and the radii (six or seven inches) are the longest I have seen. At Nandoor it is porphyritic with minute crystalline specks of lime: near Ahmednuggur is seen a cellular, indeed spongiform kind, which is hard, and the cells are empty. A small cellular and pisiform variety is found in the wonderful cave temples of Ellora, and some of the sculptured figures appear as if marked by the smallpox. This observation is partially applicable to the Boodh and Hindoo cave temples of Elephanta, Salsette, Karleh, Joonur, the Naneh ghat, and the Adjunteh ghat; all of which are excavated in basaltic or amygdaloidal strata. The Stilbite or Heulandite amygdaloid is of very common occurrence; but the most prevalent kind is that in which all the minerals noticed above are associated. The stone usually selected for building is of various shades of gray or bluish gray; has hornblende disseminated in very small crystals;

works much easier than some of the compacter basalts, but takes a good polish. The entire temples of Koorul and Boleshwur, with their innumerable alto-relievo figures and laboured ornaments, are built of this variety of trap, which is, in fact, a greenstone, although less crystalline than the European rock. There is a variety selected carelessly, also used in building, which has the structure and nearly the external characters of the last, but which, in weathering, exfoliates, and the buildings fall to ruin; such is the case with the great temple in Hurreechundurghur.

I must not omit mention of two remarkable rocks which, as far as my reading extends, have not been noticed by authors on European geology. The first is an amygdaloid in which compact stilbite is imbedded in a vermicular form. One of its localities is the insulated hill on which stands the temple of Parwuttee in the city of Poona*; and it is met with in many other places. Captain Dangerfield observed the same peculiar stratum near Sagar. He says, "There occurs an "amygdaloidal or prophyritic rock consisting of a compact basis of "wacké, in which are imbedded in great abundance small globular "or uniform masses, but more usually long *curved* cylindrical or "vermiform crystals of zeolite."†

The other rock occurs as a thick stratum of amygdaloid at the elevation of four thousand feet, in the hill forts of Hurreechundurghur and Poorundhur; and in the bed of the Goreh river at one thousand and eight hundred feet, near Serroor. The matrix resembles that of the other amygdaloids, but the mineral imbedded is a glassy felspar in tables resembling Cleavelandite, crossing each other at various angles, and so abundant as to occupy a moiety of the mass. I have only remarked it in the above localities, and it does not appear to have come under the notice of the gentlemen I have so often quoted in other parts of the peninsula.

Minerals.—Minerals are not uniformly dispersed in Dukhun. In one part quartz predominates, in another chalcedony; and these are more or less associated with jaspers, agates, hornstones, heliotrope, and semi-opal or cachalong. In other places particular members of the zeolite family prevail, nearly to the exclusion of the siliceous class; and elsewhere there is a diminution of minerals amounting almost to privation. Amethyst quartz is rare in Dukhun; when met with it constitutes the crystal, lining the interior of geodes of agate. I have

* See Plate 9, fig. 2. near to the city of Poona. † Central India, p. 323.

not seen it in veins. Pseudomorphous quartz is common; the most frequent impression is that of rhomb spar. Lime occurs only in three crystalline forms: rhomb, dog-tooth, and the dodecahedron. The first is found on the surface, and imbedded in masses of quartz and compact mesotype; the two latter forms are associated with ichthy-ophthalmite in cavities in the amygdaloid strata*.

The following are a few of the mineral localities:—At Kothool, south of Ahmednuggur, the numerous quartz and chalcedony veins cover the country with agates, colourless quartz-crystals, and chalcedony; some of the specimens are fully a foot thick, including both walls of the vein. Here are met with some few crystals of calcarious spar inclosed in quartz. At Ahmednuggur, to the above siliceous minerals, some members of the zeolite family are to be added, principally stilbite. At Nandoor, on the plain of the Godavery river, the zeolites disappear, and the siliceous minerals are limited in number. On the contrary, at Jamgaon, eighteen miles west of Ahmednuggur, on the upper terrace or plateau, in addition to all the minerals enumerated, bits of yellow and red jasper and heliotrope occur. Ascending the Mool river from Nandoor, at Aklapoor, great masses of mesotype, with radii several inches long, are found imbedded in friable amygdaloid. North of Aklapoor, at Gorgaon, a new mineral occurs in a mass two feet in diameter. Its depth I do not know, as it lay partly buried in the amygdaloid bed of the river: its colour green, and breaking into rhombs. Gorgaon is the only locality known to me of this mineral. Its measurements are those of calcarious spar, but the specific gravity is less. It is stated to be coloured by green earth. It is interesting from being unknown in the cabinets in England.

A few miles further up the Mool river, at the village of Chas, in the shoulder of a hill formed of numerous thin horizontal beds of decomposing amygdaloid, many specimens of cloudy calcarious spar, imbedded in stilbite, are found, and the siliceous minerals are rare. Ascending to the source of the river the same scarcity prevails. Three miles south-south-west of Chas, at Brahmunwareh, great masses of stilbite, of the radiating foliate kind, are imbedded in hard amygdaloid. In the hill fort of Hurreechundurghur, although siliceous minerals are not abundant, crystallized quartz of various colours is seen, a feature not characterizing the Desh or open country. South of Ahmednuggur, as far as Soagaon on the Beema river, and Meerujgaon on the Seena river,

* That comparatively rare European mineral, ichthyophthalmite, is most abundant and of great beauty in the neighbourhood of Poona.

the Ahmednuggur minerals prevail; hence descending the Beema to its junction with the Seena, a gradual diminution takes place, and at the junction they almost disappear; returning north, at Ashtee, between Kurkumb, and Mohol, a few are met with. At Oondurgaon, and up both banks of the Seena river to Purrunda, numerous and very fine specimens of milk opal, with a flame-coloured tinge in transmitted light, are found on the surface; and this is the only locality where I met with opal as a distinct mineral; and here the members of the zeolite family are very rare. At Tudwull, between Oondurgaon and Barlonee occur the only specimens of black calcarious spar seen by me in Dukhun; it is associated with transparent calcarious spar. In excavating wells in the cantonments at Poona, splendid specimens of ichthyophthalmite were brought to light; and generally in the bed of the river Mota-Mola and the neighbourhood, fine specimens of heliotrope and coloured quartz occur. The other minerals are *nadel-stein, analcime, chabasite,* and *laumonite.* Captain Dangerfield's details prove that the minerals of Malwa are identical with those of Dukhun.

Natural Salts.—Only two kinds of natural salt came under my notice, namely, muriate and carbonate of soda.

With respect to the former, many of the wells at Ahmednuggur are brackish; and there is a rivulet running into the Seena river about two miles north-west of the city, which has its source a few miles distant, called the Salt Brook. It passes over a saliferous soil; and in its dry bed, or on insulated stones standing in its stream, are incrustations of common salt intimately mixed with carbonate of lime. No use is made of this salt. The saline impregnation of the soil extends to some distance west and north-west of Ahmednuggur, as I found a handsome well at Kurjooneh, eight miles distant, filled with water so brackish as not to be available for domestic use. At Wurgaon, between Kurjut and Pairgaon, a peculiar hoary appearance of a patch of ground in the midst of withered grass, led me to examine it. The whiteness was occasioned by lime in minute particles, mixed with a little muriate of soda.

The third locality of common salt was in the bed of a rivulet at Koond Mawlee, near the falls on the Kookree river, between Serroor and Kowta. A little common salt, with a trace of carbonate of soda, appeared, incrusting the rocky bed for a few feet near the water line. I did not observe common salt elsewhere. My attention was first directed to carbonate of soda at Serroor, by observing washermen

digging for earth in the banks of a rivulet; learning that they used it to wash their clothes, I obtained a quantity; lixiviated the earth, boiled down the lixivium, and on cooling obtained a large crop of crystals, which the usual tests indicated to be carbonate of soda. I only met with one other bed, although I have no doubt they are numerous. At Kalbar Lonee, twelve miles east of Poona and two miles south of the Mota-Mola river, within an area of 200 yards, a constant moisture and partial absence of vegetation is observed. An efflorescent matter appears on the surface every morning, which is carefully swept up and sold to washermen: it is carbonate of soda. The occurrence of salts in the trap formation did not escape Captain Dangerfield's notice. He states that " the banks of the Nerbuddah (Nermada) near Mundleysir, consist of an upper thin bed of vegetable mould; a central bed, chiefly of indurated marle, strongly impregnated with muriate of soda; and a lower bed, of a reddish hue, with much carbonate of soda. In the dry season these salts form a thick efflorescence on the surface of the bank."* Saltpetre is manufactured in Dukhun, not from nitrated soils, but from the scrapings of old walls. I have also seen specimens of muriate of ammonia obtained by the brick and tile makers in burning dung, stable and other refuse matters in their kilns.

Ores.—No other ore than that of iron is found in Dukhun. It is only worked, to my knowledge, at Mahabuleshwur, at the source of the Krishna river. It occurs as a nodular hematite, associated, I understand (for I have not been at the spot myself), with laterite.† This ore produces the celebrated Wootz steel.

* Malcolm's Central India, p. 324.

† This association of nodular *hæmatite* with *laterite* is sufficiently intelligible, when we recollect the manner in which the latter rock is very frequently formed, according to the undoubted testimony of Dr. Benza (see Madras Journal, No. 13, p. 255), viz. from the decomposition of the former. The distinguished geologist whom we have named, with true philosophical caution, forbore from giving the name of laterite to the decayed hæmatite of the Neilgherries and Northern Circars, because observation has not yet determined fully whether that peculiar mineral product " is a rock *per se*, or only the result of a modification in the structure of the metallic ore" ; or, as at the Red Hills near Madras, a conglomerate (Madras Journal No. 12, p. 110): he, therefore, termed the decayed hæmatite *lateritic iron ore*. That a very great proportion of the so-called laterite owes its origin to these two sources there is no doubt; and, to use the language of Dr. Benza, " it is a common mistake to apply the name to decomposed rocks of the primitive class, and to any other that have a red, ochreous colour, and softish consistence." Evidence appears to be still wanting to prove that it ever is found as a distinct formation; all the facts recently observed go to show that it is nothing but decomposed hæmatite, or other rock; or that it is a conglomerate.—Editor *Madras Journal.*

Organic Remains.—I did not meet with organic remains of any kind whatever. Captain Coulthard* in Sagar, Major Franklin in Bundelkand, and Captain Dangerfield in Malwa, were equally unsuccessful. Dr. Voysey, indeed, mentions a bed of freshwater shells in a stratum of indurated clay near the Tapty river in the Gawelghur hills; also at Medconta, two-thousand feet above the sea, on trap†; but these may have been recent, as he does not say to the contrary.‡ Mr. Calder, in his general observations on the geology of India,§ says, "But hitherto the most striking phœnomenon in Indian geology is the almost total absence of organic remains in the stratified rocks and in the diluvial soil." As this must have been written with a knowledge of Dr. Voysey's paper, it being in the same volume with his own, it is probable he considers the shells recent.||

Thermal Springs.—Thermal springs do not exist in Dukhun within my limits; but there are three distant localities in the Konkun below the ghats, where hot water gushes up from numerous crevices in trap rocks over an extensive surface.

The first is at Vizrabhaee, forty-eight miles north of Bombay, where the principal springs are in the bed of a river, and in the monsoon are consequently lost in the swollen stream; but in traversing the jungle in the vicinity I have met with detached pools of hot water, which are unaffected by the rains; their temperature is very high. The second

* Physical Class, Asiatic Researches, p. 81.

† Mr. Malcolmson discovered extensive deposits of fossil shells and seeds of *charæ*, resting on granite and basalt, in the Sichel hills to the north of the Godavery river in the territory of Hyderabad (See Madras Journal, No. 12, p. 203). That gentleman's specimens collected in this locality, were sent home a considerable time ago, for examination by Mr. Lyell, from whom some account of them may shortly, it is hoped, be expected. Mr. Malcolmson's *Notes on the Geology of the country between Hyderabad and Nagpur*, may be studied in conjunction with Col. Sykes' Memoir, as they treat of tracts between the same parallels of latitude, the former commencing with the meridian of longitude where the latter leaves off.—Editor *Madras Journal.*

‡ Physical Class, Asiatic Researches, p. 194. § Ibid., p. 16.

|| It is necessary to observe that Colonel Sykes' Memoir, though published in the last volume of the Transactions of the Geological Society, was presented to that association so long ago as 23d January 1833. At the time it was written, therefore, the author was not aware of the extensive deposits of organic remains since discovered in several places in northern India. Thus, owing to the rare appearance of the bulky and costly volumes of this admirable Society, the communications when given to the world have lost their freshness and novelty, and, as in this instance, are behind hand in knowledge of recent discoveries. If the publication of its transactions is to be extensively useful for the advancement of geological science, the Society must descend from the dignity of a *quarto*, to the utilitarian system of *octavo* journals.—Editor *Madras Journal.*

locality is that mentioned by the late Dr. White, of the Bombay army. The hot wells are called Devakl Unei, and are fifty miles south-east from Surat,* at the foot of some hills ; the temperature in the different springs ranges from 111° to 120° Fahr. They are spoken of as being in the vicinity of Anaval and Veval, but as these places agreeably to the map of India, are only thirty miles from Surat, there is evidently some mistake with regard to the distance. The third locality is at Mahr, on the Bancoot or Fort Victoria river, about seventy-five miles south of Bombay. I know of these springs only from report. The whole of the above springs, extending through 3° of latitude, lie nearly in the same parallel of longitude (73°), and are within twenty-five miles of the sea.

In a manuscript report to the government of Bombay, on the province of Khandeish, Colonel Briggs has the following passage testifying to the occurrence of thermal springs above the ghats :—

" Among the natural curiosities of Khandeish are the hot springs of the Satpoora hills, particularly those of Soonup Deo and Oonup Deo, the former in the district of Arrawud, and the latter in the deserted Pergunneh of Amba. The former is so hot that the hand cannot be borne in it ; the latter is less ardent, and is used as a hot bath ; they are both said to possess medicinal qualities, and are considered useful in the cure of cutaneous disorders,— amongst others leprosy."

Dr. Buchanan speaks of hot springs at Rishikunda and Bhimband in the trap mountains of Rajmahl ;† and the Rev. Mr. Everest mentions a thermal spring associated with a trap bed at Katcamsan, between the 23d and 24th parallels of latitude, and longitude 86° and 87°‡. Dr. Adam mentions that of Sitakhund near Monghyr on the Ganges,§ Dr. Davy speaks of one at Cannina, ||Ceylon ; and I am informed they are to be met with in Canara. Mr. Crow, formerly commercial agent of the Bombay government in Sinde, in his manuscript reports, mentions a thermal spring near Corachee on the Indus, of which the water is almost boiling hot. In Major Cruickshank's manuscript revenue map of part of Goojrat a hot spring is placed at Tooee, near Ruttenpoor on the Mhye river, in latitude north 22° 49′ and longitude east 73° 30′ ; and there is another at Lawsoondra, eighteen miles west-north-west of Tooee. These instances, which I am satisfied could be multiplied by diligent inquiry, afford ample proof of the wide occurrence in

* Transactions of the Royal Asiatic Society, 1833. † Gleanings of Science, vol. I. p. 36.

‡ Gleanings of Science, May 1831, p. 135. § Geol. Trans., 1st Series, vol. v. p. 349.

|| Geol. Trans., 1st Series, vol. v. p. 313.

the peninsula of India of those singular phœnomena, the satisfactory explanation of the causes of which is still a desideratum in geology.*

Craters.—Volcanic products were not seen by me, nor any conformation of the hills that might be deemed an extinct crater ; although the porcelain and ferruginous clays, and the exterior coat of the various quartz and jasper minerals indicate their having been exposed to igneous action. Captain Dangerfield did not meet with volcanic matters or craters in Malwa or the Vindhya range, but states a tradition exists of the celebrated city of Oogein, and eighty other places having been destroyed at a remote period by a shower of earth ; and the people say that in the Vindhya range and Rajpeeply hills there are hollows near their summits " sometimes filled with water, which may be craters."† As the old city of Oogein stood upon a river constantly overflowing its banks, it was probably buried in alluvium. Mr. W. Hunter attributed its destruction to one of three causes,—earthquake, overflowing of the Seeprah, or drift earth by high winds ; and, although the least probable of the three, inclines to drift earth. He states there are not any traces of volcanic agency in the buried city, nor in the neighbourhood.‡ The remains of the city of Mhysir, on the banks of the Nerbuddeh (Nermada), are found in alluvium. We may safely say, therefore, there are not any indications of volcanic action of a comparatively recent date.§

* See Mr. Malcolmson's account of the thermal springs of Kair, in No. 12 of this Journal, p. 212.—Editor *Madras Journal.*

† Malcolm's Central India, Appendix, p. 325. ‡ Asiatic Researches, vol. vi. p. 39.

§ The great lake of Lonar seems to possess the characters of a volcanic crater, according to the following account by Mr. Malcolmson :

" The Lonar lake is forty miles from Jaulnah. It is a vast crater nearly 500 feet deep, and four or five miles round on the upper margin. Its waters are green and bitter, supersaturated with alkaline carbonate, and containing *silex* in solution as well as some iron. The mud is black and abounded with sulphuretted hydrogen, but the water is pure and without smell. The rocks are volcanic, and springs of pure water rise out of the salt mud or stream down the sides of the punch bowl, thus strangely sunk in a nearly level country, there being but a gentle rise to the edge. The crystals of salt found at the bottom by the divers who remove it for purposes of commerce are tabular. Between this and the hot springs of *Kair* others are found, and the direction of the range corresponds with the dykes described by Voysey in the Hyderabad country."—*Journal of Asiatic Society of Bengal*, vol. 3d, p. 302.

A particular account of this very remarkable place, with specimens of the mineral productions of the vicinity, and of the water of the lake and its saline and other contents, would be very acceptable.—Editor *Madras Journal.*

Extent of Trap Region, &c.—I will now offer a few observations on the amazing extent of the trap, laterite, nodular limestone, granite, and gneiss formations in the peninsula, limiting their application to 25° of north latitude. My personal knowledge of the country extends from the sea on the western side, to Arungabad, in 75° 33', and Sholapoor, 75° 53' east longitude; north, nearly to Kandeish, and south, to Beejapoor and the Kristna river. Captain Dangerfield takes up the country on the north, nearly where my knowledge of it terminates, and says, "It (Malwa, including the Vindhya range) appears to constitute the northern termination of a very extensive secondary trap formation, which extends from the extremity of the Dukhun, and probably even Mysore, forming all the country above the ghats, and part of the plains below, on the western side of the peninsula, including the islands of Bombay, Salsette, Elephanta, &c."* He carries the continuous trap north to Neemutch, in latitude 24° 27', at 1476 feet above the sea. Its western limit is at Dohud, longitude 74°. Major Franklin and Captain Coulthard take it up in the eastern limits of Malwa, and trace it through Sagar; and it continues to an unknown extent towards Sohagpoor and the source of the Nerbuddeh river, on the table-land of Amarakantah, in longitude 82° east. Dr. Voysey describes its eastern limits at Nagpoor, latitude 21° 10' N., and longitude 79° 14' E. at 1000 feet above the sea. Mr. Calder states it passes from Nagpoor southward by the confines of Hyderabad, as low as the 15th degree of latitude, and taking a north-west direction terminates on the sea-coast at Bancoot or Fort Victoria, in latitude 18°. But specimens of rock shown to me from the Kolapoor country above the ghats, between the parallels of latitude 16° and 17° N., bear testimony to the trap extending nearly a degree and a half further south along the ghats than Mr. Calder supposed. Indeed its southern limit in the Konkun, Mr. Fraser states to be at Malwan, fifty miles north of Goa.† From the above evidence we have proofs of a continuous trap formation covering an area of from 200,000, to 250,000 square miles, a phœnomenon unexampled in any other country whose geological structure has been examined. It appears to me, however, that the above are not the absolute limits of the trap. Dr. Buchanan‡ and Mr. Jones§ describe the

* Malcolm's Central India, Appendix, p. 320.

† Geological Transactions, 2d Series, part 1. p. 153.

‡ Gleanings of Science, vol. iii. January, 1831, p. 1.

§ Physical Class, Asiatic Researches, p. 165.

Rajmahl hills in latitude 25° and longitude 88° to 89° E. as trap; the latter says the basalt is of amazing thickness. The Rev. Mr. Everest,* in a journey from Calcutta to Ghazipoor, passed four distinct broad beds of trap between the parallels of north latitude 23° and 24°, and longitude 84° and 87°. He states these beds to have an inclination to a common axis, and he thinks it probable they are connected beneath the granite and gneiss. Mr. Royle travelling the same route, observed the same beds. Mr. Everest's diagram shows their longitudinal axis on a line between the Rajmahl hills and the sources of the Nerbuddeh and Soan rivers; and as the trap of the Vindhya range and Sagar extends towards these sources, it is very probable the ramifications are connected with the beds (seen by Mr. Everest) and the Rajmahl hills, forming a belt across India from the 73° to the 89° of longitude, extending, in fact, from near the mouth of the Nerbuddeh river to the Ganges at Rajmahl. The southern limit of trap is much lower than is assigned to it by Mr. Calder,† as Dr. Voysey describes a basaltic dyke at Seringapatam, in latitude 12° 26′; and Mr. Calder himself mentions partial deposits of overlying rocks as far south as Cotallum, at the extremity of the great western range, between the parallels of latitude 8° and 9°. Mr. Babington, passing through Mysore, describes all the black rocks he met with as hornblende passing into basalt. He evidently adverts also to nodular basalt.‡

Age of Trap.—With respect to the age of the great trap formation of India, it would appear from Major Franklin's Memoir on Bundelkund, that its northern extremities rest on sandstone, which he considers identical with the new red sandstone of England; the trap would therefore be posterior to the carboniferous series and belong to the supermedial order. But the Rev. Mr. Everest§ adduces valid reasons for questioning the correctness of Major Franklin's opinion; and it may be inferred, that he is doubtful with respect to the exact equivalent in Europe of the Indian sandstone, as it is much associated with the primitive rocks.‖ In fact, where are the oolitic rocks above, and the

* Gleanings of Science, vol. iii. p. 135.

† The limitation of trap by Mr. Calder of course is only intended by him to be understood as of a *continuous formation*: basaltic dykes, and veins, of every shape and size, being universally found in S. India. (See Dr. Benza's geological papers in Nos. 12, 13 and 14 of this Journal). EDITOR *Madras Journal.*

‡ Geo. Trans. 1st Series, vol. v. p. 325.

§ Gleanings of Science, vol. iii. p. 211.

‖ Gleanings of Science, vol. iii. p. 213.

magnesian below the red sand, where the rock salt and gypsum, and where, above all, the characteristic organic remains of the lias and magnesian limestone? It would be idle, therefore, to speculate on the era of a formation without a standard of comparison to direct the judgment. The question of the manner of the formation of the horizontal beds of trap with their vertical edges is very interesting. It will be said they were ejected under the pressure of an incumbent ocean. If such had been the case, where are the marine remains, and would not there have been sedimentary deposits upon them? Moreover, if viewed as coulées from craters, would not the beds have thinned out, instead of preserving the parallelism of their superior and inferior planes and their vertical edges.

*Laterite.**—Laterite is a ferruginous clay mottled red and yellowish. When first dug from its bed, it is soft, and is easily fashioned into the form of bricks or large square masses for building; and if my recollection serves me right, it constitutes the material of the walls of the fort at Tellicherry and the jail at Calicut. It rapidly indurates on exposure to the atmosphere. It is destitute of fossils as far as is yet known.

That curious and very extensive rock, aptly denominated laterite (I learn from the information of a friend), occurs at the source of the Kristna river in latitude 17° 59′, at an elevation of 4,500 feet above the sea. It covers the low land between the sea and the great western range from the southern Konkun to Cape Comorin, and, agreeably to Dr. Davy, passes into Ceylon. I casually observed it at Tellicherry and Calicut, respectively seven hundred and forty-four and seven hundred and fifty-six miles south of Bombay; and at Calicut granite rises through it. On the low land at the base of the great *eastern* range, Mr. Calder says it re-appears between the 11° and 12° parallels of latitude, and recurs in increasing patches passing northwards, covering granite. The Rev. Mr. Everest speaks of laterite forming a fringe to great part of the bay of Bengal and covering the edge of the granite of either peninsula.†

Nodular Limestone.—In addition to the evidence already adduced of the extensive occurrence of nodular limestone, Dr. Buchanan mentions

* With regard to laterite, see note at foot of page 364 of this article, and the former Numbers of this Journal quoted therein.—Editor *Madras Journal.*

† Gleanings of Science, vol. iii, p. 135.

having met with it in Rajmahl trap hills, in Bengal, and in Mysore. A writer in the 'Gleanings of Science'* states that it occurred in repeated borings for water in Calcutta, at from 50 to 112 feet below the surface. Another writer† says, it is "very extensively distributed throughout Hindoostan," and further asserts that it is a "most distinguished feature of Indian geology." The Rev. Mr. Everest and Mr. Royle remarked it in their journey before adverted to. The few organic remains hitherto found imbedded, belong to living species. The following is the analysis of "Kankar"‡ (nodular limestone) by Mr. Prinsep.§

Water of absorption	1.4
Carbonate of lime	72.0
Carbonate of magnesia	0.4
Silex	15.2
Alumine and oxide of iron	11.0
	100.0

Kunkur, or nodular limestone, has been likened to the cornbrash of the English strata; but its geological position (principally superficial), and the absence of characteristic fossils, present insuperable objections to their identity.||

Granite.—The late Dr. Voysey states, that he "had reason to be-"lieve, partly from personal observation and partly from specimens "obtained from other sources, that the basis of the whole peninsula "of India is granite; he had traced it along the coast of Coromandel, "lying under iron clay (laterite); also in the bed of the Godavery "river, from Rajamahendri to Nandair; and he had specimens from "the base of the Sitabaldi hills of Nagpoor, from Travankur, Tinne-"velli, Salem, and Bellari." Mr. Stirling in his memoir on Cuttack says, "The granite where my specimens were principally collected "appears to burst through an immense bed of laterite (iron clay) "rising abruptly at a considerable angle".¶ Major Franklin adds to the above quotation, "the plains of Bundelkhund attest that granite is

* Gleanings of Science, vol. i. p. 169. † Ibid. vol. i. p. 365. ‡ Properly *Kunkur.*

§ Gleanings of Sicence, vol. i. p. 278.

|| Kankur seems to be a sedimentary rock, resembling the *travertine* of Italy; some is ancient, and some modern and still forming. For Dr. Benza's opinion of this substance, see Madras Journal No. 12, pp. 15, 27.—Editor *Madras Journal.*

¶ Phys. Class, Asiatic Researches, p. 37.

"there the basis rock." Ceylon is exclusively granite and gneiss; finally, I observed granite rising through laterite at Calicut on the Malabar coast. With these facts before us, we can scarcely question the truth of Dr. Voysey's opinion; an opinion involving the belief, with reference also to the extent of trap, that the whole peninsula of India and Ceylon, covering an area roughly calculated of 700,000 square miles, is of igneous origin.*

Sedimentary Rocks.—I am not aware of the existence of any sedimentary rocks in western India, south of Baroach, excepting such as have probably originated in the consolidation of comparatively recent alluvium.

Recapitulation.—I close this paper with a recapitulation of the characteristic geological features of the peninsula; namely,—the amazing extent of the trap region, and the horizontal position of its stratified beds the granitic basis of the whole country; trap veins in granite; the absence, as far as is known, of that uniform series of rocks which constitutes the formations of Europe; the extended and peculiar nodular limestone and laterite formations; the occurrence of pulverulent limestone in seams; and finally, the non-discovery hitherto of the fossil remains of extinct animals within the limits of the peninsula.

A few words are necessary in explanation of the sections (Plate 9) which accompany this paper. They represent two principal spurs from the ghats, and converge to the same point at the junction of the Goreh and Beema rivers. In strictness they are not sections;—ramifications of the spurs, and hills at short distances north and south of the central vertical plane being inserted: they partake, therefore, of a slightly perspective character, but this does not affect the general correctness of their geological features. Fig. 1. comprises the range of hills between the Under and Beema rivers, and has a length of about seventy-five miles. Fig. 2. shows the mountains between the Bore ghat and the source of the Mota river, and extends nearly eighty miles. The len gth and elevation are expressed by different scales, and from this cause the outlines of the mountains are not rigidly correct. A bare outline is traced from the ghats westward to the sea, for the purpose of showing

* More extended observation proves this universal prevalence of granite. Dr. Benza found it at the summits of the Neelgherries, and in the plains, and we have specimens from the Goomsoor mountains on the eastern coast, and from very many other localities. —Editor *Madras Journal.*

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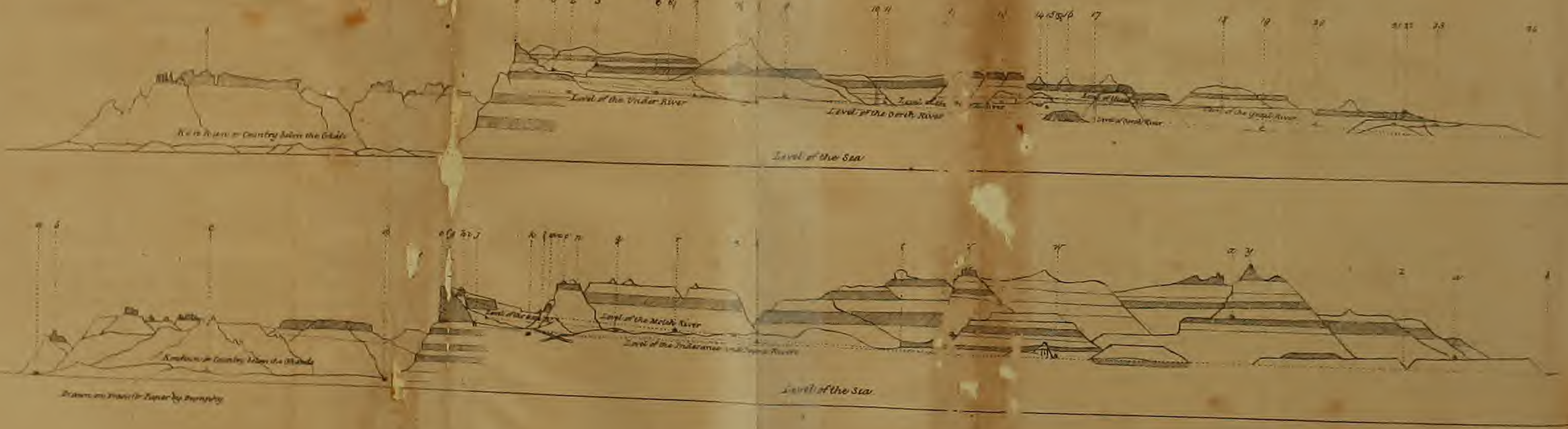

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the curious forms of the weathered basaltic caps and ridges of the mountains in the Konkun.

The elevations were determined either barometrically, or thermometrically. Those marked "B." in the subjoined description are barometrical, and result from simultaneous observations with previously-compared barometers; all the necessary corrections having been applied, for temperature, moisture, and latitude. Those marked "W." were obtained by ascertaining the boiling-point of water at different elevations with delicate thermometers: they are not to be relied upon within one hundred feet, although in some instances, when tested by barometrical measurements, they corresponded within a few feet.

DESCRIPTION.

Fig. 1—Elevation and declination of the country above the ghats, between 73°, 35′ and 74° 49′ east longitude, and the parallels of 18° 50′ and 19° 10′ 31″ north latitude: shewing the geological structure of the same.

1 —Mullunghur.
2 —Hill at Ahopeh, 3525 w.
3 —Ahopeh, source of the Goreh river.
4 —Neelsee, 2326 w.
5 —Beema Shunker, source of the river Beema, 3090 b.
6 —Pahtun on the Goreh, 2242 b.
6½—Ambolee, 2279 w.
7 —Mhou, 2104 w.
7½—Tulleghur.
8 —Ambegaon, 2044 w.
9 —Warreh, 2123 w.
10 —Dyke near Ombreh.
11 —Ombreh, 2081 w.
12 —Goreh, 2028 b.
13 —Mahloonga, 2094 w.
14 —Kheir, 1963 b.
15 —Chakun, 1936 b.
15½—Pait, 2482 b.
16 —Munchur, 1877 w.
17 —Dyke at Digghee.
18 —Pabul, 2035 w.
19 —Kowta, 1830 b.
20 —Cheencholee, 1871 w.
21 —Serroor, 1742 b.
22 —Kurdeh, 1873 w.
23 —Neerwee, 1704 w.
24 —Bed of Goreh and Beema rivers, at junction 1499 w.

Fig. 2—Elevation and declination of the country above the ghats, between 73° 35′ and 74° 49′ east longitude, and the parallels of 18° 28′ and 18° 50′ north latitude: shewing the geological structure of the same.

a.—Panwell at high water mark.
b.—Panella.
c.—Choke.
d.—Campolee, 240 feet w.
e.—Hill above Kundalla, 2694 w.
f.—Kundalla, 1743 b.
g.—Source of Moteh river, 3136 w.
h.—Hill fort of Koaree, 3163 w.
i.—Village of Koaree, 2525 w.
j.—Slanowlee, 1949 b.

k.—Ambegaon on the Powna river, 1831 w.
l.—Yagruh on the Moteh river, 2466 w.
m.—Karteh cave, 2531 B.
n.—Karleh travellers bungalow, 2016 B.
o.—Hill fort of Loghur, 3382 B.
p.—Dykes in Karleh valley.
q.—Borkus on the Molah river, 2083 w.
r.—Moteh, 100 feet above Moteh river, 2156.
r 2.—Wurgaon, 1981 B.
s.—Damun on the Powna river, 1785 w.
t.—Panowleee on the Powna river, 1783 B.
u.—Adkunwaree at foot of Singhur, 2277 w.
v.—Hill fort of Singhur, 4162 B.
w.—Poona, (Colonel Sykes' house), 1823 B.
x.—Pait at foot of Hill fort of Poorundhur, 2950 B.
y.—Summit of Hill fort of Poorundhur, 4472 B.
z.—Bed of Beema and Moteh Mola rivers at the junction, 1703 w.
a.—Neerwee, 1704 w.
b.—Bed of Beema and Moteh Rivers at the junction, 1499 w.

The shaded parts are basalt of various kinds; the unshaded are varieties of amygdaloid, quartz, zeolite, &c. &c.

Of the Panoramic sketches, Plate 8, No. 1. is a distant view of the mountains, on which are situated the celebrated hill forts of Jewdun, Hurreechundurghur, Koonjurghur, and Sewneir, in which Sewajee, the founder of the Mahratta empire, was born. It is taken from the hill N. of the town of Goreh.

No. 2. is a view of the hills, to the north and east, as seen from Lakungaon in the flat broad valley of Jooneir (Sewneir).

No. 2.* is a continuation of the view No. 2, from the N. round to the west.

No. 3. a sketch of the hills, to the north and east, as seen from the summit of the armoury, in the fort of Ahmednuggur.

No. 4. is a sketch of the northern flank of the plateau, on which the city of Ahmednuggur stands; as seen from Wamooree, in the plain of the Godavery river.—*Transactions of the Geological Society of London. Second Series, Vol. IV, page* 409—432.

2.—*A Statistical and Geological Memoir of the Country from Punah to Kittor, South of the Krishna River.**—*By* James Bird, Esq. M.R.A.S., F.R.G.S. *of the Bombay Medical Establishment.*

Some hasty observations, collected during a rapid march that I made in 1824, between Punah and Kittor, gave rise to this memoir, which though brief and imperfect, may not altogether be devoid of interest, since the geology and statistics of few countries are less known than those of India. Connected as this portion of the globe now is with the political and commercial prosperity of Great Britain, the resources of the country, the mineral treasures of its rocks, the capabilities and productions of its soil, the condition of the inhabitants, and their prospect and means of attaining a higher scale of civilisation, deserve the attention of the legislator, merchant, philanthropist, and man of science. Its statistics and geology are yet desiderata: and though the portion of information here communicated be but a speck on the ocean that lies before us, it will perhaps contribute something towards a clearer view and more accurate chart of the whole, which may be brought, I hope, to perfection in the course of time.

The nature of the soil and appearance of the country.—Two routes may be followed in going from Punah to Kittor. The first lies in the immediate vicinity of the Krishna river; and, after crossing and re-crossing it several times from the neighbourhood of Satara to the village of Yerur, meets the other route which lies farther north. It leads through the towns of Sangli and Merich; but, as the vicinity of the Krishna is one unvaried scene of cultivation on a level surface and dark sandy soil, it requires little notice. The other remains to be described.

From Punah to Kittor, the road runs in a south-east direction, parallel to the west coast of India; the Ghats, or western Vindiya mountains being on the right-hand, as the traveller proceeds southward. This route crosses the Krishna, Ghatparba, and Malparba rivers, besides a few others of lesser magnitude, of which the course indicates a southern declination of the country. The two latter rivers, flowing north-easterly for some distance, indicate a partial declination in that direction.

The country within this tract, though comprehending a great variety of soil, may be divided,—1st, Into the table land of the Dekkan,

* We have introduced this paper as an appendix to Col. Sykes' memoir, as it offers further interesting particulars regarding part of the same tract.—Editor, *Madras Journal.*

terminating near the town of Pusasaoli and at the Nahwi Ghat, or pass from the high land to the plain below; 2dly, Into that stretching from hence to the Ghatparba river; and 3dly, The tract between the Ghatparba and Kittor.

The parts now subject to British authority are the territories composing the Punah collectorate, and extending to the west bank of the Nira river, the country of the Satara Raja, which is more or less under the control and management of the resident at that court, and the taluks of Padshapur and Belgaum, at present under the authority of the political agent in the southern Mahratta country. The remainder is divided among the southern Jagirdars, and other tributaries of the British government, which exercises no control over its territorial management.

The Dekkan division, during the dry season, has a very bleak appearance. In travelling southward we continue to pass over chains of barren hills, with flat tops, which occasionally assume conical forms, but never exceed, I think, the moderate height of fifteen hundred feet. Their sides are neither abrupt nor sloping, and are covered by numerous blocks of black rock, which, in the interior of the mountains, appear to have a tabular arrangement, giving them, at a distance, a fortification-like aspect, as if one circumvallation, contained within another, ascended from below.

Only a few stunted bushes are found growing on these hills. The principal of them are different species of mimosæ, the carissa carandas, the flacourtia sepiaria, and the aula of Hindustan.

Between the hilly chains narrow valleys are formed, of which the soil is generally light and gravelly, being ill adapted for any cultivation but that of bajri* and juari,† which require the assistance of a plentiful monsoon. From the scarcity of rain, however, during last season, the crops had not attained more than half a foot in height, though it was now the month of November, and would be totally lost in consequence.

At the village of Jejuri, instead of the continued mountain chains running east-north-east, with narrow openings between, the hills are disposed in a circular manner, like an amphitheatre, and form corresponding valleys. The only produce of these hills is a species of euphorbium called "chuppal shein."

From Jejuri to the banks of the Nira river the country is poor, and the soil is little more than the *debris* of the rocks. But, on approaching the Nira, this becomes black and very susceptible of cul-

* Holcus spicatus.

† Holcus sorgum.

tivation, if the round stones scattered over its surface were only removed. The village of Lonud, on the east bank of the Nira, and only a few miles distant, is surrounded by many fine fields well supplied with the means of irrigation and producing abundance of vegetables. The great defect in the agriculture of this part of the country is the want of inclosures, which might be made at little expense, the prickly euphorbium and nerium-leaved being found close at hand for this purpose. Such inclosures, both here and in other parts of the Dekkan, would be a great improvement, since they would defend the vegetation against the strong north-east wind which blows nearly one half the year, and, from its drying influence, robs the soil of its natural moisture and deprives the plants of benefit from the dew.

Beyond Lonud, we enter the Salpa pass, and come to the valley of Satara. Here the soil is much richer than that previously met with, being black and alluvial. It rests on a very deep substratum of grey earth denominated *chunkar*, from its containing *chuna*, a calcarious carbonate.

A more plentiful supply of rain in this district had favoured the crops, and the appearance of the country, from its verdure, was pleasing to the eye. The hills, which were green to the tops and covered with brushwood, offered an agreeable contrast to the bleak and barren parts of the country just passed over.

The situation of the village of Deour, in this valley, is romantic and beautiful. It is built on the south-east bank of a deep nulla, which forms a branch of the Wasna river, of which the banks are high and earthy and the bed gravelly. The wild oleander grows in abundance close to the water edge; and, at the village, a variety of fine trees rise in majestic grandeur and afford a desirable shade from the noonday heat of a tropical sun. The houses here are also better built than those usually met with in this part of the Dekkan, and are neatly roofed with flat tiles. The general direction of the streams flowing through this valley is south; those previously met with being north.

From Deour to Pusasaoli is two stages, and the road leads through the Nạhwi Ghat. The hills near the Ghat became broken, and the country beyond Pusasaoli is flat, only one or two solitary hills being visible for some distance.

Pusasaoli, which is a large town, contains a good bazaar, and supports a manufactory of black kumlies* for the Satara market.

The different kinds of soil known here are a dark brown one called "tambra," and a gravelly earth denominated "sherwut" or "karrak,"

* A sort of blanket.

according as it contains a less or greater proportion of *chuna*. The substratum of the former is trap in a state of decomposition; and of the other, trap with beds of *chuna*.

The first differs but little from the soil of Gujarat, called by Mr. Marshall kali-bhui, of the lower level. It is adhesive and cracks by drying; but, if irrigated, may be cultivated with chuplagheon.*

When the field is ziraut, or dry land, "harbarri jundla"† and shetgheon,‡ may be raised during the cold weather on this kind of soil; but bajri is its most common produce, which comes to perfection in the rainy season. The other kinds are usually cultivated with kardu|| and karli.§

The neighbourhood of this town presents extensive fields of good black soil in a waste state, which have not been cultivated on account of the almost total absence of rain during the last two seasons. The fields on the east side only were in use, as abundance of means from nullas and wells exists there for irrigation.

Parts of the country comprehended in the second division are equally barren as those that have been described in the first; but the rich and beautiful fields on the banks of the Krishna, amply compensate for the few miserable villages and unproductive lands which we meet with near the Yerla river.

Among the latter the village of Aundhli was the most poor and desolate. The soil, which is here very sandy, rests on a bed of gravel, and produces nothing without the assistance of a plentiful monsoon; from the failure of which, last season, an almost total absence of vegetation became the natural consequence, and the inhabitants, with the exception of a few, had deserted the village.

The distinctions of the soil known at this place are "changli kali zamin," or pure black earth, which is a tolerably rich black mould from three to four feet deep, resting on another of a grey colour, which contains much *chuna*. It is divided into the dry and garden lands; but of the latter there are very few near Aundhli, and these are usually assessed at twelve rupees per bigah. The next kind of soil is that known by the name of "marut," which is a black earth of a reddish tinge resting on gravel, and is usually two feet deep. This is generally cultivated with sealu,¶ and is taxed from six rupees and a quarter to seven and a half. The last of the soils is "karrak," which, like the former, rests on a bed of gravel, but is seldom more

* Triticum monocum.

† Cicer arictinum.

‡ Triticum spelta.

|| Carthanus Persicus.

§ Verbesina sativa.

¶ Holcus saccharatus.

than a foot in depth. It is divided into a better and worse kind, according as the proportion of grey calcarious earth be more or less to the quantity of stones and gravel. It commonly lets from a rupee and a quarter to a rupee and a half, and is cultivated with different kinds of oil plants.

As we approach the banks of the Krishna, the country lies before us one extensive plain to the south-east and north-west, whilst the ridges of hills on the north and south are barely visible and at a distance. The banks of the river, which are deep and shelving, are composed of black earth with mixed sand. The greater part of the soil on the north or left bank is of this description, but that on the right or south bank is more gravelly.

From the Krishna river at Yervoi, to the Ghatparba at Argul, the country undulates, and presents here and there hilly ranges of broken basalt. Some parts of it consist of extensive plains covered by a little stunted grass, serving as pasture to numerous flocks of antelopes, where only a few patches of scanty cultivation may be seen about the villages, and nothing can be expected in the way of improvement when the poorness of the soil, and the want of water, are inseparable obstacles to all attempts at cultivation.

On the banks of the Ghatparba the hills of Padshapur became distinctly visible, and have a beautiful green appearance from being covered by thick jungle to the top, announcing at once the great difference of the country we have now approached from that we have left behind.

The greatest length of the hills appears to be from east to west, but the fine valleys, surrounded by them, open to the north and south. It is in this direction, also, that the Ghatparba flows to form the falls of Gokauk, which will be noticed after having described the appearance of the country through which our route lay. The valleys between the hills are very fertile and highly cultivated. Many of the fields have been reclaimed from a state of jungle waste by cutting down and burning the brushwood ; and much more in this way remains to be done, but can only be performed by those who have capital, and to whom, therefore, liberal encouragements should be held out. The soil is light and gravelly, but capable of producing rich crops of sealu and tur.*

Near Belgaum the country again becomes undulating, and the low sloping hills which here diversify the landscape, are covered by a deep stratum of black earth to within a few yards of their summits.

* Citysus cajan.

Amygdaloidal pieces of broken basalt may be found on the surface of their greatest ascents, and numerous springs of good water are seen percolating through the amygdaloid rock composing the interior of the hills. The small streams flowing from thence, when obstructed in their course, form bogs, where a continued annual production and decay of water-plants causes an accumulation of the soil.

But in situations where the water is in sufficient quantity to reach the hollows and lower grounds, it is then retained by means of a bund or dam, in order that the field may be cultivated with rice. The soil of these hollows is black and alluvial.

In other places the soil of Belgaum, which is red and ferruginous, proves very inimical to healthy vegetation. The mango trees, which are very numerous in this vicinity, soon become dry and withered in appearance, and never acquire that beautifully conical form which they invariably assume in a more favourable and natural bed. The country for many miles to the north-east, is composed of marshy ground, and is cultivated in the monsoon with rice, and in the cold season with harbarri.

From the village of Chota Bagwari, fourteen miles beyond Belgaum, the red ferruginous soil may be found at the base of the mountain ridges until we reach Kittor, where the hills have flat tops, and are covered by thick jungle instead of pasture grass, as at Belgaum. They are composed of a stratified rock shewing alternate white and brown stripes, of which the extraordinary magnetic property will be described in the mineralogy of this part.

Water is here less abundant in the high land than at Belgaum, but is in greater quantity both in the tanks and nullas. Rice is always cultivated on the low lands, and sealu is the usual product of the higher level.

Falls of Gokauk.—This cataract, which is formed by the stream of the Ghatparba river, passing over a perpendicular quartz rock of a hundred and seventy-six feet, receives its name from the old fort of Gokauk, now in ruins. From this it is distant about two miles; is nearly ten miles east of the town of Padshapur, and about a mile from the village of Kanur. The Ghatparba here flowing east-south-east, not finding a passage north-eastwards through the body of the quartz sandstone hills of Padshapur, has forced itself in a southern direction, and passes into an extensive plain of which the declination is southerly.

In the dry season the body of water forming the fall is not very

considerable ; and the stream, after being broken by an intermediate projection of the rock, descends in two separate columns to a semicircular basin of still water. It has, then, nothing very grand in its appearance similar to what is told us of Niagara ; but, in picturesque beauty, may bear a comparison with the other celebrated cataracts which have engaged the attention of travellers. The whiteness of the descending columns ; the glittering rainbow appearance of the dazzling sun-beams on the silvery spray ; the murmuring noise of the water falling into the clear still basin below ; the black rugged appearance of large square blocks of perpendicular quartz rock abounding in the bed of the river ; and the natural loneliness of the surrounding jungle, conspire to leave behind impressions which may be better felt than described.

When, however, the stream of the Ghatparba has been swollen by the rains of the monsoon, the cataract will be seen to greater advantage. The breadth of the river at this time cannot be less than a hundred and eighty yards, and the sheet of descending water must form a grand and magnificent object.

Even the apathetic Hindu could not here contemplate unmoved the majesty of nature, having recorded his admiration of her works by erecting a temple on either side of the cataract ; and dedicating them to that God who, in his creed, possesses supreme power in nature's destructive operations.

Where the quartz sand-stone hills ascend from the river there is a Mahadeva temple built on each bank, which, judging from the style of the architecture, may lay claim to considerable antiquity. The roofs are formed of long flat slabs of quartz rock, supported by short thick pillars of the same, and must have been constructed at great trouble and expense, when we consider the hardness of the materials composing them. The general figure of the temple is oblong ; and each consists of only one story having several smaller side ones. They, therefore, differ from Hindu temples of modern erection, which are usually pyramidal, and have several stories diminishing in succession to the top.

The rock in the bed of the river, and near the edge of the cataract, has been formed into deep circular holes of two to three feet in diameter, which have been apparently formed by the eddies originating in a stream of water, that, meeting with resistance, receives a circular motion.

From the brink of the semicircular basin, hollowed out by the falls, we descended to the water edge in order to view the cataract

below. The path lies on the right-hand side between vertical columns of quartz rock; and the breadth of the passage is only sufficient to allow of one person going at a time. The opening leading into this from above is so low that it was necessary to creep on our hands and knees to get through. The loose blocks of rock wedged between the perpendicular columns, and forming its roof, hung over our heads like the sword over Damocles, keeping us in continual apprehension that the frail means of support giving way we might be crushed by their fall.

On descending to the water edge the cataract is seen to less advantage than when viewed from above, the rainbow appearance being no longer observable. The echoing noise of the falls, however, is grand and impressive; and the large square masses of stone which have been hurled below by the rains of the monsoon, or the roots of the jungle plants penetrating fissures of the rock, lead us to think on the slow and silent influence of time midst this depth of solitude.

The scenery about the cataract is worthy of admiration; and, in concluding this account, I may venture to say, that if a traveller's expectations are not fulfilled by a visit to the spot, his curiosity will at least be gratified.

Mineralogy of the country.—The elevated table-land of the Dekkan is exclusively composed of rocks belonging to the fletz-trap formation. The hills which rise on the western ghats as a base have conical or tabular forms, and are sometimes distributed in long ridges or terraces which run east-north-east.

At the openings in the hills west of Punah, known by the name of the Ghats, and which are the passages from the lower land of the Konkan into the higher land of the Dekkan, these tabular forms are grand and beautiful. They are generally triangular shaped, and insulated from each other by broad and deep ravines, of which the perpendicular descent cannot be less than twelve or thirteen hundred feet.

The rock composing these tables is compact basalt of a black colour, in which hornblend predominates.

About Punah, and further south-eastwards, the rocks are generally amygdaloidal, and become lighter in colour the farther they are removed from the western entrance. This amygdaloid is in no respect different from the toad-stone of extra tropical climates. It shews embedded masses of chalcedony, zeolites, and green earth; and in the neighbourhood of water courses, at the depth of five-and-twenty or

thirty feet below the surface, contains drusy cavities of crystallized quartz, the appearance of which, in digging wells, indicates that water is near.

A clay-iron ore, of a dark-brown colour, is found at this depth; and is sometimes penetrated by circular canals, which have been pervious to water.

The amygdaloid rock, accompanying the iron ore, is similarly penetrated; but its canals are filled up by spiral pieces of white chalcedony.

Calcarious carbonate, denominated chuna, abounds on the banks of the water courses; and is seen occasionally in alternate strata with an impure bole, called by the natives " geru." Chuna is also found, in the form of calk-tuff, in the beds of the nullas; and is seen venegenous in the basaltic and amygdaloid rocks at the village of Lonud, where calcspar is also found in veins.

Green-stone, heliotrope, agates, and horn-stones, are to be met with in the beds of the nullas, and on the banks of rivers.

On the surface of the amygdaloid, and immediately below the soil, specimens of rock crystal are occasionally discovered. They are attached to the quartz veins, which run through the amygdaloid of the Dekkan east and west, corresponding in this respect with the hills of quartz-rock, which we afterwards meet with at Padshapur. The basalt of the Dekkan occurs both in columnar and globular forms, and varies in colour from a bluish grey to a deep black. The latter kind is capable of receiving a high degree of polish, and is employed by the Hindus for the interior of their temples.

Along with the basalt and amygdaloid, there is a determinately aggregated rock of a grey colour, which is found in beds: its structure is porphyritic; and the disseminated crystals appear to be felspar, sometimes associated with calcspar. A somewhat similar rock, but of a red colour, is also distributed in beds through these hills. Of this the structure is amygdaloidal.

Where the formation is traptuff, common opal is to be met with.

From Pusasaoli to the banks of the Ghatparba, the mineralogical nature of the country is little different from what has been now described. Chalcedonies are fewer, and columnar basalt becomes less common the farther we go to the southward. Jaspery clay-iron ore and red hematite appear more frequent, and are particularly abundant near the town of Mulgaon.

At the village of Argul, only a few hundred yards from the north bank of the Ghatparba, the country changes. The rock here has some likeness to sandstone, but is in fact aggregated quartz-

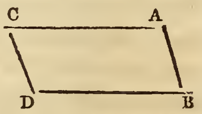
rock. It forms whole hills, of which the long diameter extends from east to west. The structure of this rock is extremely hard, and in appearance it varies from a secondary sandstone to that of pure quartz.

This quartz-rock formation extends as far as Belgaum, where we again meet with the amygdaloid. The undulating ground here, which is of inferior height to the hills of broken basalt, is composed of a red clay-iron-stone or laterite. It is sometimes of a yellowish colour, soft, and in a state of decomposition, from the action of the weather: in such instances it has much resemblance to iron rust. In either case it is hard and undulated, forming an aggregated rock which is used for building.

From Belgaum to Kittor we meet with numerous pieces of iron ore scattered over the surface of the ground. They are most abundant where the soil is red; and are chiefly to be met with near the hills lying south-east from Kittor. Some specimens of the ore are bubbled, having the appearance as if they had suddenly cooled while in a state of fusion. From the mixed nature of the rocks found in this part of the country, quartz, iron-stone, and basalt, being indiscriminately huddled together, I am inclined to think that some strong convulsion of nature must have produced this at some time or other; and the generally bubbled appearance of the rocks warrants this conclusion. Specimens of black quartz are found among these rocks.

In the immediate vicinity of Kittor the structure of the rocks is coarse slaty. They are composed of alternate layers of quartz and iron ore, varying in thickness from the sixteenth-part of an inch to that of a whole, which gives the rock a striped appearance.

The effect which this rock produces on the magnetic needle is, however, the most extraordinary part of its nature. It has no inherent magnetic power, since it does not attract steel under any form; but when cut into a parallelogramical figure, of which two sides are longer than the other two, as here represented, it exhibits great power over the needle of a small pocket compass.



If the side A B be presented to the north pole, it repels the needle; but when brought round to the south pole, it attracts it. When the side C D is presented to the north pole, the effect is *vice versa*; and if the stone be moved circularly over the glass of the compass, the needle is set in motion.

It would appear, therefore, that this rock possesses polarity, but does not exhibit any magnetic power in attracting simple steel. The ore it contains is probably magnetic iron ore; and the well-ascertained

fact in magnetism, that two magnets having a free motion will attract when different poles are directed towards each other, and repel when the adjacent poles are of the same name, seems to explain the phenomena.

*The cultivation of pán**.—The agricultural productions which are in general use among the people of the country having been already incidentally mentioned, I here pass over to others less frequently cultivated; and will now give some account of the cultivation of pán.

This leaf which is in very general use among all classes of Hindus, and is chewed by them with supari, is the produce of a creeping plant, which has been denominated a vine. It has a light-green colour and sub-astringent taste, having a degree of pungency which at first excites an increased flow of saliva, but which diminishes, by repetition, the secretions of the mouth, and parches the tongue and fauces.

In using it, a few bruised pieces of the areca-nut, with two or three grains of ilachi,† and a small proportion of carbonate of lime, are wrapped up in one or more leaves of the plant. The whole is then chewed by the natives of India, from the same bad influence of example which has given tobacco a similar station among the inhabitants of Europe.

In the cultivation of pán, both wind and sun are carefully excluded, and a cool shade is studiously preserved for the rising plant. With this view an acre or more of ground is inclosed by a double hedge of thuhar,‡ or closely-bound twigs; and the natural black soil of the place has its capacity for retaining moisture increased, by the addition of a considerable quantity of red argillaceous earth. This fact is practically well known to the pán cultivator, who is generally of a Hindu cast named Tirghul, and is supposed to have originally emigrated to this part of the Dekkan from the Carnatic.

The ground being now ploughed, and manured with horse-dung, if procurable, is smoothed by the harrow; and is then considered to have undergone sufficient preparation for receiving seeds of the sheoga,§ hutga,‖ and neemb¶ trees, which grow up as the future supporters to the plant, and intended to serve after the manner of hop-sticks in England. These seeds are usually sown, at the end of the monsoon, in parallel rows of two feet wide; but sometimes a greater distance is left when the garden ground has not been divided into beds,

* Piper-betel.
† Cardamomum minus.
‡ Euphorbia neriifolia.
§ Hyperanthera moringa.
‖ Coronilla grandiflora.
¶ Melia azadirachta.

by which it is intended that there shall be sufficient room to allow of the operations of weeding and irrigation being conveniently performed.

On the trees springing up, some of them are removed ; and in the middle of January, when the remainder have attained a foot or two in height, pán slips are planted near each supporter, and from this date frequent irrigation of the garden becomes necessary. Generally two or more slips are inserted, which, according as they thrive, are afterwards thinned ; while, at the same time, the space of a foot and a half is left betwixt each supporter.

The remaining operations are training the pán to its supporter, renewing the red soil, and repeating the manure once a year.

The expense of making a pán-garden of this kind is estimated from four to five hundred rupees, inclusive of the expense of keeping it up until the second or third year, before which time there is no return. The pán plants are not exhausted before the eighth or ninth year, but are deemed most valuable during the sixth and seventh, the leaves being then in perfection.

Religion and classes of the inhabitants.—The Brahmans, who are divided into the Konkanist, Deshist, and Karradi sects, form but a small proportion of the inhabitants of the country, and are to be chiefly met with in the neighbourhood of great towns, where they have hereditary right in the soil. They are in great numbers on the banks of the Krishna ; and guided, as would appear, in their choice of settlements, by an idea of comfort, or the hopes of gain, are therefore less numerous in the Dekkan division than further south, where a greater field is open to their ambition, from the country being under the protection of men of their own class. Those of the Sudras practising trades, and who are divided into as many tribes as there are arts among them, also bear a very small proportion to the great body of the people, which is composed of common Mahrattas and Lingaiyats.

The common Mahrattas, who are cultivators, are principally met with extending from the Dekkan as far south as Tasgaon ; and the Lingaiyats inhabit the country from hence to Kittor. The language of the former ceases to be generally spoken after passing Tasgaon ; and the Kanari is then universally used by the lower orders of the people.

Many of the Lingaiyats are employed in trade, and are, indeed, the principal merchants on the banks of the Krishna. They pretend to high degrees of purity, and carefully abstain from eating fish or flesh—a practice not so religiously observed among the common Mahrattas.

The only object of their worship is the ling, "simulacrum membri virilis," which they generally keep suspended from their necks.

They perform this worship in the Mahadeva temples; but in those only where there is a separate and distinct apotheosis of the *ling*. The ceremonies of their religion are conducted by the viragis, acting under the superintendence of the Brahmans, at the Mahadeva temples; and they are not, as the name implies, simply religious mendicants, who, from choice, have abandoned the concerns of the world; but are the pretended offspring of the god. According to my information, every woman who, being barren, pays her addresses to the temple, and is blessed with offspring, devotes one of the children to the service of the deity; and, in the event of that child being a male, he becomes an officiating priest among the Lingaiyats.

It is almost unnecessary to remark the degrading superstition of such a religion; for however pure may have been the original metaphysical idea of the institution of the lingam, the effect now speaks for itself.

At Yerur, on the Krishna, the Lingaiyats have a celebrated temple, liberally endowed with freehold lands for the support of the Brahmans and dancing-women. It is dedicated to MAHADEVA, and is celebrated for two deifications of the ling; one in its generative capacity, named VIRABHADRA, signifying the prosperous hero; the other in a destructive capacity, named VIRAPATERA.

The Jainas are also met with in considerable numbers south of the Krishna. Their establishments are monastic, as the Jainas live in a manner separated from the other inhabitants of a village. Their houses, congregated together, and opening into a square court, are surrounded by a wall, within which stands a temple for the community, where PARISNATH is the chief object of worship.

The Jainas are mostly engaged in trade, and appear in their manners to be less influenced by superstitious observances than other Hindus.

Condition of the People.—Muhammedan history has informed us, and the experience of our time serves to confirm it, that the Dekkan has been at all times more subject to famine than most other parts on the western coast of India. This happens, as would appear, when the lighter and upper strata of the clouds are carried over that elevated table-land by a strong south-west monsoon wind. The heavier and inferior strata, when attracted by the lower country and hills of the Konkan, descend in rain; so that, none being left for the parched lands of the Dekkan, famine is an inevitable consequence; and the

miserable inhabitants, forsaking their homes to seek for food and shelter in the neighbouring countries, extend the evils which follow a partial monsoon.

After a favourable rainy season, however, the Dekkan teems with grain; though such is the irreparable loss caused by a bad one, that several prosperous years can scarcely bring with them a recompense. The little property of the people is expended in retaining their existence: their cattle die for want of food. There are few of them so provident as to think of laying in a stock of grass from the Konkan against a bad season; and their fields remain uncultivated; as they have not the means of doing so without getting more deeply in debt to an artful set of foreigners, the Gujar and Marwari Banias, who come here intentionally to raise a fortune, and take every advantage of the poor cultivators which chance throws in their way.

This is not a fanciful picture, and is a state of things obvious to all making the inquiry; for the evil has been demonstrated by the fatal experience of the last two years, in the former of which but little rain fell, and almost none during the latter. I have ascertained, by repeated inquiry, that when many of the villagers are pressed for subsistence in the hot season, it is usual for Banias to advance grain, on the condition of its being repaid double when the ensuing harvest ripens. The crop, therefore, raised by the cultivator is actually in the hands of the Bania before it has been cut down; and as the cultivator is his dependent, he has no remedy but to run again the same course.

In a country like the Dekkan, so liable to have alternate good and bad seasons, a wide field is open for the intrigues of such men; and the evil of the system is too great not to require a check from the legislature,—when it is an observation, not alone applicable to the natives of India, that men get into debt in proportion as the means of doing so become facilitated.

The government and its officers are much disposed, no doubt, to ameliorate the condition of the inhabitants; and there is reason to think that the mild spirit of British jurisprudence prevails in all that has been done for the country. It is to be feared, however, that its servants, in their over-zeal for the interest of the government, may mislead it, and adhere too strictly to former custom in their assessments of lands. It may also be doubted if the assessment of former governments forms a fair criterion for our guidance; since our executive is so good, and every thing so minutely noted, that the people are deprived of many advantages derived from the grass and waste lands under the negligence of our predecessors.

The inhabitants generally betray signs of great poverty. To see

a silver ornament on the child of a cultivator in the Dekkan, is nearly as rare as it is common in the Konkan. It may be urged, perhaps, that they are thoughtless, spending their money on feasts, festivals, and marriages; and that they are less guilty than other Hindus in this respect, I dare not advance, though I may venture to assert that they are not more so than those in other parts of the country, where there is more wealth and greater comforts. The fault rests not then with them, but with the country where they have been doomed to live; and of this such is the poverty, that it must be assessed lightly until a little capital has been created among the riots or cultivators.

It is a general complaint in the Dekkan, and indeed among all classes of natives, that the country is becoming poorer and poorer every day. That the Hindus are much inclined to make such complaints, and sometimes without cause, is well known; but this is one which is well founded. India is situated, in regard to her commerce with England, precisely as Europe formerly was in regard to India, where large commercial purchases being made by the former to supply the necessities of the state and individuals, little is taken in return by the latter country, which thus drains the other of its specie. This increasing poverty cannot be prevented if resources in this country are not found to render it independent of supplies from England, or its exportable produce be not allowed import there on more favourable terms than those now in force.

In a country, too, like this, where the manure of the dairy is used as fuel, it is difficult to decide what should be done for the improvement of the land. It is known, however, that soil is much improved by stagnant water; and if the natives in favourable situations would be advised to construct earthen bunds for retaining the rains of the monsoon, much of the hilly soil might be converted into tolerable land. Though the inhabitants on the banks of the Krishna appear more comfortable than those of the Dekkan, they were suffering, in common with the latter, from the partial fall of rain during last year.

The country about Belgaum can seldom or ever want for water, when so many springs are flowing from the hills; and as the monsoon both there and at Kittor seldom entirely fails, the lands are very productive, and the condition of the inhabitants good. There is, moreover, a spirit for manufacture among the people in that part of the country, which has, no doubt, bettered their condition, and forms a striking contrast to that of the people farther west.—*Journal of the Royal Asiatic Society*, vol. 2d, pp. 65, 80.

3.—*Abstract of the Journal of a Route travelled by Captain* S. F. Hannay, *of the 40th Regiment Native Infantry, from the Capital of Ava to the Amber Mines of the Húkong valley on the South-east frontier of Assam.—By Captain* R. Boileau Pemberton, 44*th Regiment. N. I.**

From the termination of the Burmese war to the present period the spirit of inquiry has never slept, and the most strenuous exertions have been made by the officers employed on the eastern frontier to extend our geographical knowledge to countries scarcely known but by name, and to acquire some accurate information regarding the manners, customs, and languages of the various races of men by whom they are inhabited.

The researches of Captains Bedford, Wilcox, and Neufville, and of Lieut. Burlton in *Assam*, dispelled the mist which had previously rested on the whole of the eastern portion of that magnificent valley; and the general direction and aspect of its mountain barriers, the courses and relative size of its rivers, the habits of the innumerable tribes who dwell on the rugged summits of its mountains, or on the alluvial plains at their base, were then first made the subject of description, founded, not on the vague reports of half-civilized savages, but on the personal investigations of men, whose scientific attainments enabled them to fix with precision the geographical site of every locality they visited. The journey of Wilcox and Burlton to the sources of the *Irawadi* river had proved the absence of communication between it and the great *Tsanpo* of *Thibet*, but they were unable to prosecute their examination further east; and though their researches had extended to a point not more than twenty miles distant from the meridian on which the labors of the Jesuit Missionaries in *Yunan* had been abruptly terminated, the intervening space, and great valley of the *Irawadi* still remained closed against them, and every attempt to enter either, from *Assam* or *Manipur*, was defeated by the jealous vigilance of the Burmese authorities.

It is generally known that the course of the lower portion of the

* Attention has been forcibly drawn, within the last few years, to the countries situated to the north-east of our Indian empire; both on account of the interest and importance of the discovery of indigenous tea plants in Assam, and for the political consequence which these regions possess, from their vicinity to, and relationship with, the great empires of China and Ava. We introduce, therefore, the above paper as a narrative of the most novel and interesting expedition of recent times as regards the East. A route map accompanies the article in the Bengal Journal; but the reader will be able to follow the traveller with the published maps of the country, and to note down pretty correctly the newly described places.—Editor *Madras Journal.*

Irawadi river, or that part extending from *Rangun* to *Ava*, had been delineated by Lieut. Wood of the Engineers, who accompanied Captain Symes on his embassy to that Court; and that the features of the surrounding country, the size of the towns, its natural productions and population, had at the same time been investigated by the accurate Buchanan. Charts of this portion of the river, extending to *Monchabu*, the capital of the great Alompra, had at a far earlier period been constructed, but the surveys were avowedly made in a manner not calculated to inspire much confidence in their accuracy; and the attention of Europe was first extensively drawn to this field of inquiry by the publication of Symes, whose exaggerated views of the civilization, power and resources of the Burmese empire were generally adopted, while the more accurate estimates of his successor Coxe were treated with comparative disregard.

In the very infancy of our intercourse with the Burman empire, and when the most persevering attempts were made to obtain settlements at various points of the coast, the more remote stations on the upper portion of the *Irawadi* river were not forgotten; and *Bamu* or *Bamo* was even then known as the emporium of a trade between the Burmese and Chinese, in which our aspiring merchants were most anxious to share. It is asserted that, at the commencement of the 17th century, factories were established in that neighbourhood, but the permission to remain was shortly afterwards withdrawn, and the information which it is supposed was then obtained of the surrounding country has never been rescued from oblivion:—this is the less to be regretted as the loss has been fully compensated by the results of recent research; and the journey of Captain Hannay, of the 40th Regiment Native Infantry, from *Ava* up the *Irawadi* river, to the frontier towns of *Bamo* and *Mogaung*, has at length rendered this hitherto inaccessible region almost as well known to us as the more southern districts, through which this noble river directs its course. Many geographical points of extreme interest have been determined by the personal observation and inquiries of this meritorious officer. *Bamo* has for the first time become accurately known from the same source—much valuable information has been gained respecting the trade carried on between *Ava* and *China* in this remote corner of the *Burman* empire—the habits and localities of some of the principal tribes occupying the mountainous tracts bordering on western *Yunan* have been successfully investigated—the position of the very remarkable valley of *Hukong* has been determined—the *Pyendwen* or amber mines have for the first time been examined by the eye

of European intelligence—the latitudes of the principal towns between *Ava* and *Mungkhong* have been ascertained by astronomical observation with a degree of accuracy sufficient for every purpose of practical utility, and they may now be regarded as established points, from whence inquiry can radiate in every direction with a confidence which the most zealous and enlightened investigators have been hitherto unable to feel in prosecuting their researches, from the want of a few previously well-determined positions at which to commence or terminate their inquiries.

To an act of aggression on the part of a *Singpho* tributary of *Ava* against a chieftain of the same clan residing under our protection, are we indebted for the opportunity of acquiring the information now gained, and the feud of two insignificant borderers may prove the immediate cause of a more intimate communication than had ever previously existed between our recently acquired possessions in *Assam* and the northern provinces of the *Burman* empire.

The Bisa and Dupha Gaums are the heads of two clans of Singphos, occupying the northern and southern faces of the chain of mountains, which forms a lofty barrier between *Ava* and *Assam*. The former chieftain, on our conquest of the latter country, tendered his submission and was admitted within the pale of that feudatory dependence which many other tribes of the same clan had been equally anxious to enter;—he was uniformly treated by the local authorities with great consideration, and was located at the northern foot of the *Patkoi* pass leading from *Assam* to the *Hukong* valley. Between this chieftain and the Dupha Gaum a feud had existed long previous to our assumption of the sovereignty of the country; and the latter, at the close of the year 1835, headed a party, which crossing the mountains from the Burmese province of *Hukong*, entered *Bisa*, the residence of the chief of that clan, and after ravaging and plundering the village, sealed their atrocity with the indiscriminate murder of all the inhabitants that fell into their hands. The circumstances were made known to the British Resident at the Court of *Ava;* inquiry was demanded, and security required against the recurrence of similar acts of aggression. A deputation from the capital was ordered to the Burmese frontier for the purpose of instituting the necessary investigation, and Colonel Burney, the enlightened representative of British interests at that court, failed not to avail himself of the opportunity thus unexpectedly afforded, of attaching an officer to the mission; and Captain Hannay, who then commanded his escort, was selected for the duty.

The party, consisting of the newly appointed Burmah governor of *Mogaung*, of Captain HANNAY and several Burmese officers of inferior rank, with a military escort, left *Ava* on the 22d of November, 1835, in a fleet of 34 boats of various sizes, for a part of the country which had been uniformly closed against strangers with the most jealous vigilance. "No foreigners," says Captain HANNAY, "except the Chinese, are allowed to navigate the *Irawadi* above the choki of *Tsampaynago*, situated about seventy miles above *Ava;* and no native of the country is even permitted to proceed above that post, excepting under a special license from the Government. The trade to the north of *Ava* is entirely in the hands of the Chinese, and the individuals of that nation residing at *Ava* have always been vigilant in trying to prevent any interference with their monopoly."

The mission was detained the two following days near the former capital of *Amarapura*, to complete the quota of troops by which it was to be accompanied, and whose discipline, when they did join, was very soon found to be on a par with their honesty.

"They work their own boats," says Captain HANNAY, "some of which are covered in, and others are quite open. Their musquets (if they deserve the name) are ranged here and there throughout the boat, and are never cleared either from rust or dust, and wet or dry they are left without any covering. Each man carries a canvass bag, which is a receptacle for all sorts of things, including a few bambu cartridges. He wears a black Shan jacket and a head dress or *goung-boung* of red cotton handkerchief, and thus equipped he is a complete Burmah militia man. They appear on further acquaintance to be better humoured than I at first thought them, but they are sad plunderers, and I pity the owners of the fields of pumkins or beans they come across. I have remarked that whatever a Burman boatman eats in addition to his rice, is generally stolen."

Except at *Kugyih*, where there are said to be several Christian villages, of which, however, no satisfactory information could be obtained, the progress of the mission was unmarked by any circumstance of interest, until its arrival at *Yedan*, where they entered the first *kyouk-dwen*, or rocky defile, through which the river directs its course. Lower down, the extreme breadth of the stream had varied from one to two and a half miles, but here its width was contracted to less than a quarter of a mile, with a porportionate increase in the depth and velocity of the current. During the rainy season of the year, boats shoot through these narrow passes with terrific velocity, and the numerous eddies caused by the projecting rocks, add greatly

to the danger of the passage. In this part of their course, the mission frequently met large rafts of bambus descending from the *Shueli* river, and upon them, small baskets of pickled tea, brought from the hills to the south-east of that river. This tea was said to be manufactured by a race called *Palong Paon,* who are under *Momeit.* At *Tsingu,* Captain Hannay saw three native Chinese from *Thengyichu* or *Mounyen,* and several others in the service of the noblemen of the court, had accompanied the expedition from *Ava* with the view of proceeding to the *Kyouk Tsein,* or Serpentine mines near the sources of the *Uru* river, west of the *Irawadi.* On the 30th of November the party left the village of *Yedan Yua,* where a perceptible change takes place in the character of the country and river. "The latter," says Captain Hannay, "from covering an extent of miles is sometimes confined within a limit of 150 yards, without rapids or torrents, as I had expected, but almost as still as a lake. In some places its depth is very great being upwards of ten fathoms. It winds through beautiful jungle, in which the *pipal, simal* trees, and bambus, are conspicuous, and it has, generally speaking, a rocky bed and banks, which last rise to a considerable height, and composed of sandstone, which varies from dark to a white and yellow colour." At the next stage, or *Thihadophya,* Captain Hannay mentions a very remarkable instance of the tameness of the fish, which are not allowed to be killed, and are found from about a mile below the village to an equal distance above.

"If rice is thrown into the water from the boat, a dozen fish, some of them as much as three and four feet long, come to the surface, and not only eat the rice, but open their mouths for you to put it in, and they will allow you to pat them on the head, which I and some of my followers actually did. Some of these fish are apparently of the same species as those called in India *guru* and *ruta* : indeed the Hindus who are with me called them by these names. The breadth of head is remarkable, and the mouth very large; they have no teeth,—at least so the people told me, whom I saw feeling their mouths." This spectacle, strange as it must have appeared, was hardly more so than the adventure of the following morning, when Captain Hannay "was awoke by the boatmen calling to the fish to participate in their meal."

On the 1st of December the expedition arrived at *Tsampaynago,* which has been before mentioned as the limit, beyond which, even natives of the country are not permitted to proceed without an express order from the Government. The custom-house or thana is on the

right bank of the river, and *Male myu* which is close to it, contains about 800 houses with many very handsome gilded temples.

The Myothagyi or deputy governor of the town, is also the custom officer, and a tax of 15 ticals per boat is levied on the Chinese coming from *Bamo.* Old *Tsampaynago myo* is situated at the mouth of a small river which flows from *Mogout* and *Kyatpen,* and falls into the *Irawadi* immediately opposite the modern choki of that name. The sites of *Mogout* and *Kyatpen,* where some of the finest rubies of the kingdom are obtained, were pointed out to Captain Hannay as lying in a direction N. 80° E. of *Tsampaynago,* and about 30 or 40 miles distant, immediately behind a very conspicuous peak called Shueu Toung, which he estimated at 3,000 feet high. The *Madara* river, as well as that of *Tsampaynago,* flows from the same mineral district which must greatly facilitate communication with it. The inhabitants of the country were unwilling or afraid to communicate any information regarding these secluded spots, and their exact locality is still a subject of conjecture. The mines are described as in a very swampy situation, and surrounded at a trifling distance by lofty hills. The three places at which the gems are principally sought, are *Mogout, Kyatpen* and *Loungthe,* and the principal miners are Kathays or Manipuris, with a few Chinese and Shans. The other most celebrated spot is *Momeit,* the site of which Buchanan found some difficulty in determining, but which Captain Hannay learnt was not more than two or three days' journey, or between 20 or 30 miles north of *Mogout* and *Kyatpen.* While at this place Captain Hannay says, "they heard the people who were cutting bambus in the hills, rolling bundles of them down the face of the steep. Having made a road by felling the trees, the woodmen allow bundles of 150 and 200 bambus to find their way to the bottom, which they do with a noise that is heard at the distance of eight miles. They are then floated down the small river into the *Irawadi,* but this operation can only be effected during the rains." The party now began to feel the cold excessively, and its severity was greatly heightened by a strong northerly wind, which seldom subsided until the afternoon, and was particularly keen in the narrow passes or *kyouk-dwens.*

Tagoung Myu, which was reached on the 5th of December, is an object of peculiar interest, as it is said to have been built by a king from Western India, whose descendants afterwards founded the kingdoms of *Prome, Pagan* and *Ava.* Captain Hannay found the walls of the old fort dwindled away to a mere mound, and hardly discernible from the jungle with which they were covered; but adds, "that enough

is still seen to convince one that such a place did formerly exist. The fort has evidently been parallel with the river, and is on the left bank which is high and composed of sandstone. About half a mile inland, the remains of the inner walls run north and south, with an opening or gap to the east, in which there is an appearance of a considerable ditch, which I was told is filled with water in the height of the rains. The whole has more the appearance of an old brick fort, than any thing I have seen in *Burmah*, and I should say it had been built by a people different from the present race of Burmans."

About a mile to the south of *Tagoung* are the extensive ruins of *Pagan*, which stretch as far as the eye can reach, and here Captain Hannay discovered impressions of Hindu Buddhist images, stamped upon a peculiar kind of brick composition (terra cotta), and with inscriptions which he imagined to be written in some variety of the Deva-nagri character. The Burmese on the spot were unable to explain their nature or origin, and the learning of an aged priest proved equally incompetent to the task of deciphering them :—they were subsequently, however, submitted to some Burman antiquarians at the capital, by the Resident, whose paper on the subject and a drawing of the images appeared in the 51st No. of the Journal of the Asiatic Society.

At *Shwezi-goung*, a large pagoda among the ruins of *Tagoung*, Captain Hannay obtained an extensive view of the subjacent country, and more accurate information of the site of the celebrated mines of *Momeit* than had been practicable at an earlier period of his voyage. From these accounts it appears that the locality which is said to produce the finest rubies in the kingdom, is about forty-five or fifty miles east of *Tagoung Myu*, from whence it can be reached by a foot traveller in three or four days, and by a laden bullock in ten. A drove of these animals was just about to leave *Tagoung* for *Momeit* on Captain Hannay's arrival, and from the owners he learnt "that after selling their *ngapee* (potted fish) at *Momeit*, *Mogout* and *Kyatpen*, they proceeded to the country of the Palongs, which bounds the district of *Momeit* on the east, and purchase tea, both pickled and formed into balls, a part of which is brought to *Ava*." The fish, which apparently forms the staple of the trade, is said to be of a remarkably fine description, and is dried in a manner peculiar to *Tagoung*.

On the left bank of the river, between *Henga-myo* and *Tagoung*, the teak tree first begins to appear, and at *Kyundoung* on the opposite side, it is said, that timber is found sufficiently large to form a boat

from a single tree; it grows principally on the western face of the hills, at whose eastern base *Kyundoung* stands. A delay of two days at this village enabled Captain HANNAY to ascend to the summit of the first range of hills, by the road which leads across them to the valley of the *Mu* river: he found it a well-beaten track and great thoroughfare, by which the inhabitants of the country as far west as *Wantha Myu*, are accustomed to convey their supplies of fish, salt and oil from *Kyundoung*, a place apparently of some trade: the bazar contained 50 shops which were large and supplied with British piece goods, uncleaned cotton, silk, and cotton Burman dresses, coarse white cloth and other articles of country manufacture. "Besides these," adds Captain HANNAY, "I saw three Chinese shops, where spirits and pork were sold. The streets were crowded with people from the interior, who had come to make purchases, and amongst them were several Kadús, a race of people of a different origin from the Burmahs, and scattered over the tract of country between this and *Mogaung*. They are most numerous in the districts of *Manli* and *Mankat* situated on the *Meza* river* which comes from the north and west, and runs between the *Kyundoung* range and that called the *Thegyain* range, still seven or eight miles north of our present position. Rice, being the staple of the country, is an article of barter, and is sent in considerable quantities to *Ava*. Cotton, brought from the interior, is also an article of barter, and a good deal of it is sent to *Bamo*, but a part of it is made into cloth on the spot, as I saw several looms at work. Yellow and red cotton handkerchiefs of British manufacture sell here for two ticals a piece, which is about 100 per cent. beyond the price at *Ava*."

To this point of their progress, no diminution in the volume of the *Irawadi* was perceptible, and the channels proved sufficiently deep for the passage of large boats, from which we may infer that all the principal feeders or affluents, which pour their tributary streams into the *Irawadi* were still further north, and had not yet been reached. The first of any importance noticed is, the *Shue li khyoung* on the left bank, the northern branch of which flows from the Chinese frontier town of *Santa-fu*, called by the Burmahs *Mola Santa*, and a southern branch from *Momeit*, the site of the celebrated ruby mines already noticed: the confluence of these streams is represented as occurring at the village of *Laha* about 40 miles from the *Irawad*

* A small stream not more than fifty yards broad, with but little water.

Neither branch can be of any magnitude, for Captain Hannay remarks that at the point of junction with the *Irawadi*, the breadth of the *Shueli* is not more than 300 yards, and that it contained but little water,—a satisfactory proof that, this stream can have no connexion with the *Tsanpo* of *Thibet.*

At *Yebouk yua*, a day's journey above the *Shue khyoung*, two boats passed the party with Chinese in them from *Bamo.* "They work their boats which are of the Burman round-shaped flat-bottomed description, and seem to be of a tolerable size, as there must have been at least twenty men in each. These boats are particularly well adapted for the navigation of the *Irawadi*, as they do not draw more than 18 inches of water."

On the 13th of December the party reached *Katha*, a town of some extent on the right bank of the river, containing about 400 houses, and a population whose numbers appear to be annually increased by large parties who come from the interior, and take up a temporary abode on the right bank of the river, and on the numerous islands and shoals in its bed, for the purpose of fishing and traffic: at the close of the season they return to their respective homes in time for the resumption of agricultural labour, and a traveller ignorant of this nomade custom, which appears to be very general in the upper part of the *Irawadi*, would form an exaggerated estimate of the population of the towns and villages in which they are thus temporarily congregated. "The bazar of *Katha* was well supplied with good native vegetables of various sorts, fresh and saltfish, pork sold by Chinamen, dried cocoanuts, sugar-cane, and rice from the coarsest to the best quality, the latter selling at 15 ticals a hundred baskets." Captain Hannay also saw a small quantity of stick lac in the bazar, but it was dear, and of a description very inferior, to that which is procurable at *Rangun*, and is brought from the Shan territory east of *Ava.* Even at this remote spot there was a 'tolerable display' of British piece goods, but not nearly to the extent noticed at *Kyundoung*. Captain Hannay mentions a *Kyoung* or monastery recently erected by the Myothagi of *Katha*, as one of the most remarkable objects of the place. "It is a large wooden building covered with beautiful carved work, and situated near the river. The grounds surrounding it are extensive, and very tastefully laid out with fruit trees and flowery shrubs, amongst which I saw the Chinese rose in great plenty." The river is here confined by lofty banks not more than two furlongs apart, but the stream is very deep, and the spot appears to be a particularly favorable one for obtaining a good section of the river, the velocity

of which at *Wegyih*, a village above *Katha*, Captain Hannay estimated at one mile and a half an hour, with an average depth of 18 feet. This would give a discharge of about 52,272 cubic feet per second, while that of the *Ganges* at the same season may be assumed on Rennell's authority at 80,000 feet per second, giving for both a proportion of 1 to 1.53. No satisfactory comparison can, however, be yet instituted between these magnificent rivers, for up to the present moment we are without a single section of the *Irawadi*, which could be safely assumed as the basis of a calculation sufficiently accurate for such a purpose.

At *Kyouk-gyih*, which the party reached on the 17th, they had fairly entered the remarkable curve in the *Irawadi* which had been previously represented in all our sketches of the river, and served, in the absence of more accurate information, as a point of reference, generally well known to the Burmahs and Shans. Here there is a ledge of rocks, over which the stream passes with so great a degree of rapidity, as to render it very difficult of navigation during the rains. The rocks are serpentine and the sand collected amongst them appeared to be a mixture of small garnets and iron sand. The right bank of the river, for two miles below *Kyouk-gyih*, is composed of small round stones and sand, and Captain Hannay was told that the natives wash the soil for gold.

No circumstance throughout this voyage afforded a more gratifying proof of the friendly feeling generally of the Burmese authorities, than the attentions which Captain Hannay received at every place at which they halted. Houses were erected for his accommodation at the various stages of the route, differing in no respect from those intended for the Myuwun of *Mogaung*; presents of fruit, rice, and vegetables were daily made to himself and followers, and the supposed tedium of his evenings was relieved by a band of singers and dancers, who are found at almost every town and village in the Burman empire. At *Kyouk-gyih*, these attentions were shewn to a very remarkable degree by the Woon of *Munyen*, " whose civility," says Captain Hannay, " was the subject of conversation with every one in the fleet."

" Every individual has received sufficient rice and fish for two days' supply, and my boat was filled by him with all sorts of provisions, enough certainly to last myself and my followers for a week." The house of this liberal Woon, Captain Hannay describes " as a very neat and comfortable dwelling, with a remarkably clean compound, in which there is a garden laid out with a great deal of taste, and, besides

many articles of costly Burman household furniture, he has a number of very fine muskets and other arms." The party had now approached within a comparatively short distance of *Bamo*, and the vicinity of this celebrated mart was shewn, in more numerous villages than had been seen for several preceding days. From *Shuegu Myu* to *Balet*, a distance of three miles, the houses appeared to extend in an uninterrupted line, and *Kywun-do*, the name of a celebrated island in the river, covered with 100 pagodas, is most conveniently situated between these towns, the inhabitants of which hold their principal festivals upon it, at particular seasons of the year.

Near this spot, is the entrance to the second *kyouk-dwen*, the scenery of which appears to be very magnificent, and is thus described by Captain Hannay. " The river passes directly through the hills, which rise perpendicularly on both sides to the height of 400 feet; they are rocky, and of irregular and singular forms, having at the same time a sufficient number of trees on them to render the scenery very striking. One part of the range, on the right bank, rises as perpendicularly as a wall to the height of 500 feet, forming a grand and terrific precipice. This *kyouk-dwen* extends for four miles, and the hills which form it, are throughout of a rocky nature. The upper part of them appeared to be sandstone, resting on a base of blue-coloured limestone, mixed with veins of beautiful white marble; and at one spot I saw large masses of compact and foliated primitive limestone, along with calcarious spar in large pieces."

Koung-toun, which the mission reached on the 20th, is said to contain about 200 houses, and is noted for the defence made by its Burmese garrison, against a large invading force of Chinese during the last war between these two nations. A ditch surrounds the town, and the remains of a brick redoubt, loop-holed for arrows or musquetry are still perceptible encircling a pagoda. " This is now all that is to be seen," adds Captain Hannay, " of the old fortification, but the town is still surrounded by a double palisade of bambus with sharp stakes placed between them." These defences are intended for the protection of the inhabitants against the Kakhyens, a tribe occupying the hills to the east, who frequently come down in small bodies for the purpose of carrying off cattle. Captain Hannay saw a great number of this tribe at *Koung-toun*, where they barter their rice and cotton for salt and *gnapee* (potted fish), and describes them, with few exceptions, as perfect savages in their appearance; their cast of countenance forms a singular exception to the general rule, for it is not at all Tartar in its

shape, but they have, on the contrary, " long faces and straight noses, with a very disagreeable expression about the eyes, which was rendered still more so by their lanky black hair being brought over the forehead so as entirely to cover it, and then cut straight across on a line with the eyebrows. These people, though surrounded by Shans, Burmese and Chinese, are so totally different from either, that it is difficult to imagine from whence they have had their origin."

On the 20th of December the fleet moored at a village about five miles below *Bamo*, which being a town of great importance, and the residence of an officer inferior in rank to the *Mogaung* Woon, some previous arrangements were necessary to enable the latter to land with the eclât due to his rank. On reaching the town late on the following day, they found the left bank on which it stands so precipitous, that they were compelled to cross to the opposite side of the river, and a feeling of jealousy having arisen between the two Woons of *Mogoung* and *Bamo*, the former resumed his journey on the 22d, which compelled Captain HANNAY to defer the inquiries he was so anxious to make until his return in April, when he found the people far more communicative than they had ventured to be in the presence of the *Mogaung* Woon. The information obtained on both occasions will be more advantageously shewn in a connected form than in the detached portions in which it necessarily appears in his journal, and Captain HANNAY's first remark solves a difficulty, which, like the Adria of ancient history, has proved a stumbling block to modern investigation. In the course of inquiry into the sites of the principal towns on the *Irawadi* river, that of *Bamo* naturally held a very prominent place, and some of the native Shans, who were questioned on the subject affirmed that it was on the bank of the *Irawadi* river, while others, whose opportunities of acquiring information had been equally good, positively denied this statement, and fixed its position on the left bank of a small stream which flows into the *Irawadi*, about a mile above the present town. Captain HANNAY reconciles the conflicting statements, briefly but satisfactorily, in the following remark:—

" I find that this is a *modern* town erected on the banks of the *Irawadi*, for the convenience of water-carriage between it and *Ava*. The *old* Shan town of *Manmo*, or *Bamo*, is situated two days journey up the *Tapan* river, which falls into the *Irawadi* about a mile above the new town of *Bamo* or *Zee-theet-zeit*, or new mart landing-place."

" This modern town," says Captain HANNAY, " is situated on high unequal ground, and the bank towards the river is from 40 to 50 feet

in height, and composed of clay. With the exception of *Ava* and *Rangun* it is the largest place I have seen in Burmah, and, not excepting these places, I certainly think it the most interesting. The novelty of so large a fleet as ours passing up (and no doubt, having heard that a European officer was of the party) had attracted a great crowd of people to the river side, and on landing, I felt as if I were almost in a civilized land again, when I found myself amongst fair complexioned people, wearing jackets and trowsers, after being accustomed to the harsh features and party-colored dress of the Burmans. The people I saw were Chinese from the province of *Yunan*, and Shans from the Shan provinces subject to *China*. *Bamo* is said to contain 1500 houses, but including several villages which join it, I should say it contained 2000 at least, 200 of which are inhabited by Chinese. Besides the permanent population of *Bamo*, there are always a great number of strangers there, Chinese, Shans, and Kakhyens, who either come to make purchases or to be hired as workmen. There are also a great number of Assamese both in the town and in the villages immediately connected with it, amongst whom are several members of the *Tapan* or *Assam* Raja's family. *Bamo* is the jaghire of the *Tapan* Raja's sister, who is one of the ladies of the king of *Ava*.

" The inhabitants of this district live in large comfortable houses, which are thatched with grass, and walls made of reeds. They are generally railed in, and all the villages have bambu palisades surrounding them. The Palongs of the Chinese frontier are, I am told, remarkably industrious. They are good dyers, carpenters and blacksmiths, and all the *dhas* or swords used in this part of the country are made by them." " I received," adds Captain Hannay, " great attention from the Myuwun of *Bamo*, and also from the head Chinese there ; they sent me tea, sugar, dried fruits, and vegetables, for which I, of course, made a suitable return. The annual caravan from *China* had not arrived, and the supply of Chinese articles in the shops was very small."

The people of *Bamo* were so strongly impressed with the idea that Captain Hannay's only object was to find a road by which British troops might penetrate to *China*, that he found it extremely difficult to obtain any information from them regarding the routes into that country. The Chinese themselves, however, proved more communicative, and from them he learnt the existence of several passes from *Bamo* into *Yunan* ; but as one of these presents far greater facilities of transit than the others, it is generally adopted for commercial intercourse, and the mode of carrying it on is thus described. " At

the distance of two miles* above *Bamo* the mouth of the *Taping* or *Tapan* river is situated. This river has a direction N. 70 E. for about two days' journey, when it cuts through the Kakhyen range, and under these hills, old *Bamo*, or *Manmo*, is situated. To the latter place the Chinese take their merchandise from modern *Bamo* by water, and then proceed overland to the choki or *ken* of *Loailong* near *Mowan*, which they reach in three days, and from thence to *Mounyen* or *Tengyechew* in the province of *Yunan*, at which place they arrive in eight or nine days. The road from *Bamo* to *Loailong* is through the hills, which are inhabited by Kakhyens and Palongs, after which it passes through the country of the Shans, called by the Burmans, *Kopyi-doung*. The road is described as being very good, and quite a thoroughfare. The *Tapan Khyoung* is not navigable for large boats, in consequence of which the Chinese use two canoes tied together, with a platform over them, for the transport of their merchandise to *Manmo* or old *Bamo*, and for the remainder of the journey it is carried on ponies or mules."

This description of the size of the *Tapan Khyoung*, which is also called by the Shans *Numtaping*, completely sets at rest the keenly agitated question of its identity with the *Tsanpo* of *Thibet*, and the theory of KLAPROTH (who, on the authority of Chinese writers, calls it the *Pinglankhyoung*, and maintains it to be the prolongation of the *Tsanpo)*, is shown to have no better foundation than his unauthorized change in the position assigned to the latter river, in that part of its course which passes through *Thibet*. Captain HANNAY describes the *Taping* as not more than 150 yards broad, and with only sufficient water to float a small boat. The Singphos affirm that it is a branch of the *Shueli Khyoung* (the *Lungshue kiang* of the Chinese) from which it separates above *Momein*, but the accuracy of this report appears highly questionable.

The principal article of trade, which is cotton, is entirely in the hands of the Chinese, who arrive at *Bamo* in the months of December and January. The greater part of their imports is taken to *Ava*, as neither the natives of *Mogaung* nor *Bamo* could afford to purchase them. "What they dispose of here," says Captain HANNAY, "are copper pots, carpets and warm jackets." These articles are also taken all over the Burman territories, as far west as the *Khyendwen*. There are several cotton godowns here, belonging to the Chinese, and there are constantly residing in the town 500 of these people, which,

* In another place it is mentioned as only one mile above *Bamo*.

with the numerous arrivals from different parts of the country, gives the place a very business-like appearance, and there is of course a good bazar." There is a very neat temple built by the Chinese of *Bamo*, which Captain Hannay visited, and was most politely received by the officiating priest. "On entering his house," says Captain Hannay, "he rose to meet me, saluted me in the English fashion, asked me to sit down, and ordered his people to bring me tea; after which he sent a person with me to shew me the curiosities of the temple. Most of the figures were carved on wood, and different from what I have generally seen in Chinese temples; one of them represented the *Nursinga* of the Hindus. The Chinese of *Bamo*, although different from the maritime Chinese, in language and features, have still the same idea of neatness and comfort, and their manners and mode of living appear to be much the same."

"Their temple and all the houses, which are not temporary, are substantially built of bricks stained blue; the streets are paved with the same material, and the grounds of the temple are surrounded by a neat brick wall covered with tiles." "Besides the trade carried on at *Bamo* by the Chinese, the Shans, Palongs, and Singphos under *China*, are great purchasers of salt, *gnapee*, dried fish, and rice, but particularly salt, which is in constant demand; and to procure it, numbers of the above named people come to *Bamo*, *Sambaungya* and *Kountoung*. The salt which sells here for twenty ticals of silver for 100 vis, or 28 rupees for 150 seers, is brought principally from *Sheinmaga* above *Ava*, and from *Manbu*, which is situated two marches west of *Katha*. The Shans here are distinguished by their fair complexions and broad good-tempered faces. They wear turbans and trowsers of light blue cotton cloth; they greatly resemble the Chinese, and from living so near that nation, many of them speak the *Yunan*-Chinese language. They inhabit the country to the east of *Bamo*, and their principal towns are *Hotha*, *Latha*, *Santa*, *Sanla*, *Moongsye*, *Moong-woon*, *Moong-man*, *Moong-la*, and *Moong-tye*. The people are generally designated Shan Taroup or Chinese Shans."

"Although the Palongs speak the Shan, their own native language is a distinct one. The men, though small in stature, are athletic and remarkably well made. Flat noses and grey eyes are very common amongst them. They wear their hair tied in a knot on the right side of the head, and dress in a turban, jacket, and trowsers, of dark blue cloth. They are a hill people, and live in the tract of country situated between *Burmah* and *China*, but those to the east of *Bamo* pay no revenue to either country, and are governed by their own

Tsobuas. The Singpho traders I saw at *Bamo* were very different from those under *Burmah*, and according to their proximity to either Shans or Chinese, they assimilate to one or other in dress and language."

"The whole of these people," says Captain Hannay, "pay for every thing they require in silver; and were it not for the restrictions in *Burmah* on the exportation of silver, I think an intelligent British merchant would find it very profitable to settle at *Bamo*; as, besides the easy intercourse with *China*, it is surrounded by numerous and industrious tribes, who would, no doubt, soon acquire a taste for British manufactures, which are at present quite unknown to them." The revenue of the district is estimated by Captain Hannay at three lakhs of rupees per annum; and he adds, "If appearance of comfort may be taken as a proof of its prosperity, the inhabitants of *Bamo* shew it in their dress and houses. I have seen more gold and silver ornaments worn here than in any town in *Burmah*."

On leaving *Bamo*, the appearance of the country became much more hilly, and great precautions were taken to guard against surprise by the Kakhyens, who inhabited the different ranges in the vicinity of the river.

At *Hakan* the escort was reinforced by 150 soldiers from *Bamo*, and a number of families who were proceeding up the river, joined the fleet to enjoy the protection afforded by so large a convoy. The Shans who composed the quota from *Bamo* were a remarkably fine set of men from the banks of the *Tapan Khyoung*, and formed a striking contrast, in dress and appearance, to the miserable escort which had accompanied the party from *Ava*.

At the village of *Thaphan-beng* they entered the third *Kyouk-dwen* from which a very beautiful view is obtained of the fertile valley of *Bamo*, bounded on the east by the Kakhyen hills, which are cultivated to their summits. Serpentine and limestone were the principal rocks found in this defile, as well as the preceding one; and as the river was here in some places not more than 80 yards broad, with a depth of 30 feet, and its rise is in the rains 50 feet above the present level, the rush of waters must at that season be terrific. The natives, indeed, declared, that the roar at that time was so great, as to prevent them from hearing each other speak, and that the defile could only then be traversed on rafts: now, however, it coursed gently along with an almost imperceptible motion.

At *Thabyebeng-yua* they found a new race of people called Phwons, who described themselves as having originally come from a country

to the north-east, called *Motoung Maolong*, the precise situation of which could not be ascertained. Their native language, which they speak only in intercourse with each other, differs altogether from the Shan and Burmese, but they have no written character. There appear to be two tribes of this race, distinguished by the Burmahs as the great and small:—The former are found only at *Tshenbo* and in the vicinity of the third *Kyouk-dwen*, while the inferior tribe is scattered all over the country: the only difference apparently between them consists in some trifling varieties in the dialects they speak. Their extensive cultivation proved their agricultural industry, and four Chinese Shans were constantly employed in manufacturing their implements of husbandry. Their houses were of a construction totally different from any that had been previously seen, and consisted of a long thatched roof rounded at the ends and reaching almost to the ground. Inside of this and at the height of eight or ten feet from the ground, the different apartments are formed, the walls of which are made of mat.

"From the outward appearance of these houses," says Captain Hannay, "it would be difficult to imagine that they were habitations, but inside they are very comfortable, and from the great thickness and peculiar form of the roof, the inmates cannot be much affected either by heat or cold." The same description of house is built by the Shans occupying the valley of *Kubo*, and it is probable that the Phwons have adopted this style of building from some tribe of that widely scattered nation.

On the 26th the fleet reached a part of the *Irawadi*, which is considered the most dangerous point in its navigation. It is called *Pusku*, and the stream is there confined to a breadth of 30 yards, but with no less than nine fathoms of depth in the centre. The rocks bore every appearance of fierce and irregular volcanic action, varying in color "from brown, yellow, red and green, to a jet black which shone like a looking glass." The strata also presented a scene of great confusion, some being vertical, some horizontal, and others twisted; "the whole having exactly the appearance of having been poured out from a furnace."

The navigation of the *Irawadi* river up to this point had been unmarked by difficulties of any magnitude, and, with the exception of the passes through the *Kyouk-dwens*, the channel appears to have afforded, even at that season of the year, an abundant supply of water for the largest class of boats, which ply between *Ava* and *Bamo:* above the village of *Namhet*, however, they first met a succession of rapids ex-

tending for a mile and a half, which were even then considered dangerous; and Captain HANNAY remarks, that he had seldom seen in the worst season, and worst part of the *Ganges*, a stronger current, or more turbulent water than at the rapids of *Shuegyain-man*, a short distance above the village of *Namhet*.

On the arrival of the fleet at *Tshenbo*, which is about 10 miles below the mouth of the *Mogaung* river, the boats by which the party had been conveyed from *Ava* were exchanged for others of a smaller description, better adapted for the navigation of so small and tortuous a river as that of *Mogaung*. The one prepared for Captain HANNAY's accommodation was of the kind called by the Burmese "*loung*:" it was paddled by 25 men, and formed of a single tree, with the addition of a plank 10 inches broad, all round the upper part of it.

Before quitting *Tshenbo*, Captain HANNAY had a visit from the head priest, whose curiosity to obtain some knowledge of European customs and habits could only be satisfied by the display of the contents of his trunks, and the sight of his watch, sextant, and thermometer; all of which he was permitted to examine by Captain HANNAY, who regrets that he had not brought some missionary tracts with him from *Ava* "to give this inquisitive priest some idea of the Christian religion." *Tshenbo*, on the authority of this priest, is said to have been formerly a principal city of the Phwon tribe, who were dispossessed of it, about sixty years ago, by the Burmahs.

On the last day of December the mission reached the mouth of the *Mogaung* river, which Captain HANNAY ascertained by observation to be in latitude 24° 56′ 53″. Here they were to quit the *Irawadi*, which, says Captain HANNAY "is still a fine river flowing in a reach from the eastward half a mile broad, at the rate of two miles an hour, and with a depth varying from three fathoms in the centre to two at the edge."

The *Mogaung* river on which the town of the same name is situated, is not more than 100 yards wide, and the navigation is impeded by a succession of rapids over which the stream rushes with considerable velocity. The smallest boat in the fleet was an hour and a half getting over the first of these obstacles, and the Shan boatmen, who are thoroughly acquainted with the character of the river, "pull their boats close to the rocky points, and then, using all their strength, shoot across to the opposite side before the force of the stream had time to throw them on the rocks." The Burmah boatmen adopted the apparently easier method of pulling their boats up along the edge of the stream, but this proved both difficult and dangerous, one boat being upset and a man drowned. The banks of the river were covered with a dense and impervious jun-

gle, which extended nearly the whole way to *Mogaung*, and no village served to beguile the wearisome monotony of this portion of the journey, until they reached *Akouktoung*, a small hamlet on the right bank inhabited by Phwons and Shans. Here they met a chief of the *Laphae* Singphos, who had taken up his residence in this village with a few followers, in consequence of a feud with some neighbouring tribes in his own country to the north. Between *Akouk-yua* and *Tapoh* (the next village seen) the bed of the river is filled with rocks and rapids, which render the navigation exceedingly dangerous, the stream shooting over them with such velocity as frequently to rise above the bow of the boat, which, in case of unskilful management, would be instantly upset. The way in which the Phwons and Shans overcome these difficulties, formed a striking contrast to the conduct of the Burmah and Kathay boatmen. The former working together with life and spirit, still paid the strictest attention to the orders given by the head boatman ; while the latter " who think," says Captain Hannay, " that nothing can be done without noise, obey no one, as they all talk at once, and use the most abusive language to each other." He thinks the Phwons and Shans greatly superior to the Burmahs or Kathays,—meaning by the latter those Manipuris resident in *Ava*, who are Burmans in every thing but origin.

After passing the last rapids at *Tapoh* the river expands in breadth to 200 yards; the stream flows with a gentle current, and " the bed is composed of round stones which are mostly quartz. Amongst them, however, there are found massive pieces of pure crystal stone, partaking of the nature of talc, and also pieces of indurated clay of different colours. The banks are alluvial on the surface, but towards the base and near the edge of the river the soil becomes gravelly, and in some places has a stratum of beautiful bright yellow-coloured clay intersecting it."

On the 5th of January the party disembarked from their boats, and as the Myo-wun was to be installed in his new government, the landing was effected with considerable state. " Arrangements," says Capt. Hannay, " had been made for our reception, and on first landing we entered a temporary house where some religious ceremony was performed, part of which was the Myo-wun supplicating the spirits of three brothers who are buried here, and who founded the Shan provinces of *Khanti*, *Assam*, and *Mogaung*, to preserve him from all evil. After which ceremony he dressed himself in his robe of state, and he and I proceeded hand in hand through a street of Burman soldiers, who were posted from the landing place to the Myo-wun's house, a

distance of nearly a mile: we were preceded by the Myo-wun's people carrying spears, gilt chattas, &c. and at intervals during our walk, a man in a very tolerable voice, chaunted our praises, and the cause of our coming to *Mogaung*. Several women also joined the procession, carrying offerings of flowers and giving us their good wishes."

The Myo-wun appears to have lost no time in availing himself of the advantages of his situation, for on the very day after landing, he commenced a system of unsparing taxation, to enable him to pay for his appointment. A rapid succession of governors within a very few years, all influenced by the same principle, had already reduced the inhabitants of *Mogaung* to a state closely bordering on extreme poverty, and the distress occasioned by the exactions now practised was bitterly complained of by the wretched victims of such heartless extortion. The Shan inhabitants of the town were employed by the Burmese officers to enforce this excessive payment of tribute from the Singphos and Kakhyens of the surrounding hills, which had led to much ill-will on the part of the latter, by whom they are stigmatised "as the dogs of the Burmans."

"The town of *Mogaung*," says Captain Hannay, "is situated at the junction of the *Namyeen* or *Namyang*, and the *Mogaung* or *Numkong* rivers, and extends about a mile from east to west along the bank of the last named river, the west end of the town being bounded by the *Namyeen khyoung*, which comes from the district of *Monyeen* in a direction S. 43 W. The town of *Mogaung*, strictly speaking, is confined within what is now only the remains of a timber stockade. Outside of this, however, there are several houses, and within a short distance a few small villages are scattered about, but even including all these, there are not more than 300 houses. Those within the stockade are inhabited by Shans, and those outside by Burmans, Phwons, Assamese and a few Chinese. The latter to the number of fifty reside here, and are under the authority of a Thoogyee of their own nation;—they derive a profit from their countrymen who come annually in considerable numbers to purchase serpentine. Amongst them I saw both blacksmiths and carpenters, and, for the first time since leaving Gangetic India, I saw the operation performed of shoeing horses. The Shans, inside the stockade, reside in large houses, such as I formerly described having seen amongst the Phwons;—the Burmans and others live in the same description of houses as are to be seen in every part of *Burmah proper*, but all bear signs of great poverty; and if it were not for the Chinese, whose quarter of the town looks business-like and comfortable, I should say

that *Mogaung* is decidedly the poorest-looking town I have seen since leaving *Ava*. There is no regular bazar, all supplies being brought from a distance, and the market people are, with few exceptions, Kakhyens and Assamese from the neighbouring villages."

The arrival at so remote a spot of a European officer was soon bruited abroad, and Captain Hannay's time was fully occupied in answering innumerable questions put to him by a crowd of visitors, who examined his sextant with great care, under the firm conviction that, by looking through it, he was enabled to perceive what was going on in distant countries;—nor would they believe that the card of his compass was not floating on water, until, to satisfy them, he had taken it to pieces. The paucity of inhabitants and poverty of the town plainly indicated the absence of extensive trade, and Captain Hannay learnt, that, including the profits derived from the sale of serpentine, the revenues of the town and neighbouring villages did not amount to more than 30,000 rupees per annum, and the Burmah authorities can only enforce the payment of tribute from the Shans of *Khanti*, and the Singphos of *Payendwen*, by the presence of an armed force. In their last attempt on the latter, a Burmah force of 1000 men was detached from *Mogaung*, of whom 900 were destroyed; and for ten years they had been held in salutary dread by the Burmah governors of the frontier. During his stay at *Mogaung*, Captain Hannay obtained specimens of the green stone, called by the Burmahs *kyouk-tsein*, and by the Chinese *yueesh*,* and which he supposes to be nephrite. "The Chinese," he says, "choose pieces which, although showing a rough and dingy-coloured exterior, have a considerable interior lustre, and very often contain spots and veins of a beautiful bright apple-green. These are carefully cut out, and made into ring stones, and other ornaments, which are worn as charms. The large masses are manufactured by them into bracelets, rings, and drinking cups, the latter being much in use amongst them, from the idea that the stone possesses medicinal virtues. All the *yueesh* taken away by the Chinese is brought from a spot five marches to the north-west of *Mogaung*, but it is found in several other parts of the country, although of an inferior quality. Serpentine and lime-

* Monsieur Abel Re'musat, in the second part of his history of *Khotan*, is said by Klaproth (Mem. Rel. à l' Asié, tome 2, p. 299) to have entered into a very learned disquisition proving the identity of the *yu* or *yueesh* of the Chinese with the *jasper* of the ancients.—R. B. P.

The *yu* is a silicious mineral, coloured with less intensity but passing into heliotrope. It is therefore *prase* rather than *jade* or nephrite.—Ed.

stone are the prevailing formations of the base of the highest ranges of hills throughout this part of the country. Steatite is also abundant in the bed of the *Irawadi* below the valley of *Khanti*."

One very important object of Captain Hannay's mission was to cross the *Patkoi* mountains into *Assam*, and on his arrival at *Mogaung* he waited some days in considerable anxiety for the *Kakhyen* porters, who were to convey his baggage and supplies during the remaining portion of the journey :—he soon found, however, that the authority of the Burmans when unenforced by the presence of a large military detachment, was held in the most sovereign contempt by these hardy mountaineers, and after many fruitless attempts to induce the *Mogaung* woun to allow him to proceed with even a small party, he was constrained to limit his further researches to the *Hukong* valley and amber mines. Repeated remonstrances were necessary to induce the governor to proceed even so far, and it was not until the 19th of the month that an advanced guard crossed the river, and fired a feu de joie, after performing the ceremony of sacrificing a buffalo to the Nhatgyee (or spirits of the three brother Tsaubuas of *Mogaung*), without which no expedition ever marches from the town. Even then, the dogged obstinacy of the governor induced him to delay his departure, and it was not until Captain Hannay threatened that he would instantly return to *Ava* if there were any longer delay, that the wily diplomatist could be induced to move.

On the 22d they crossed the river, and the camp was formed on the northern bank, in strict accordance with Burmese custom. Captain Hannay's tent (a common sepoy's pál) was the admiration of every one but its owner, who now for the first time marched with an undisciplined rabble. "The soldiers' huts," says Captain Hannay, "are composed of branches of trees and grass, and if they wish to be particular, they cover them with a piece of cloth, which is generally some old article of dress. The Myo-wun's station is in the centre of the camp, and in front of him are his own immediate followers, whose huts are formed into a street marked by a double line of spears. At the head of this street the flags are placed, and also the two small cannons (one-pounders), which are sent with the force, I believe, for the purpose of firing three rounds morning and evening, to frighten the neighbouring Kakhyens, and which ceremony, I suspect, will be gone through with as much gravity, as if it would have the desired effect. My position is in front and a little to the left of the Myo-wun and we are completely surrounded by the soldiers, whose huts are in distinct lines, the men of each district keeping together."

On the 22d they at length set out, and the style of march was as little in accordance with the military experience of our traveller, as the previous encampment. "The men, to the number of 800, march in single file, and each man occupies a space of six feet, being obliged to carry a bangy containing his provisions, cooking pots, &c. besides his musket, which is tied to the bangy stick. This is the most common mode of marching, but some of them carry their provisions in baskets, which they strap across their forehead and shoulders, leaving their hands free to *carry* their muskets ; but as to *using* them it is out of the question, and I should say the whole party are quite at the mercy of any tribe who choose to make a sudden attack upon them." On reaching the encamping ground, however, these men gave proof how well they were adapted to this mode of travelling, for in an hour after their arrival, every individual had constructed a comfortable hut for himself, and was busily engaged cooking the rice, which, with the addition of a few leaves plucked from certain shrubs in the jungle, forms the diet of the Burman soldier on the line of march.

The tract of country through which the party passed on the first two days was hilly, and abounded in a variety of fine forest trees ; but on approaching *Numpoung*, the second encampment, the country became more open, and the pathway led through a forest of very fine teak trees. The principal rivers all flowed from the *Shuedoung-gyi* range of hills on the east of their route, and are at this season of the year mere mountain torrents, with so little water in them, that the path frequently passes over their rocky beds. The whole route from *Mogaung* to the *Hukong* valley, may be described generally as passing between defiles, bounded by the inferior spurs of the *Shuedoung-gyi* range on the east, and numerous irregular hills on the west; these defiles form the natural channels of numerous streams, which, flowing from the heights above, and struggling amidst masses and boulders of detached rock, make their way eventually to the larger stream of the *Numkong*, which unites with the *Namyen* at *Mogaung*. The only traces of inhabitants perceptible in the greater part of this route were a few cleared spots on the hills in the vicinity of some scattered Kakhyen villages, and a few fishing stakes in the mountain streams. Near the mouth of the *Numsing Khyoung* the party met with a few Kakhyen huts, which appear to have been constructed by that tribe, during their fishing excursions ; and at *Tsadozout*, an island in the bed of the *Mogaung* river, on which the force encamped on the 28th of January, they passed the sites of two Kakhyen villages, and found the ground completely strewed with graves for a considerable distance, the proba-

ble result of some endemic disease which induced the survivors to desert the spot. The finest lemon and citron trees, Captain HANNAY had ever seen, were found here, and the tea plant was also very plentiful—the leaf is large, and resembles that sold in *Ava* as pickled tea; the soil in which it grew most luxuriantly is described as of a "reddish-colored clay." Thus far, a considerable portion of the route had passed either directly over the bed of the *Mogaung* river or along its banks; but at *Tsadozout*, they crossed it for the last time, and at this spot it is described as a mere hill stream with a "bed composed of rolled pieces of sienite and serpentine, with scales of mica in it." The navigation of the river even for small canoes ceases below this spot, and those which had accompanied the party with supplies were left, from inability, to convey them further.

About four miles north of *Tsadozout* "the road ascends about 100 feet, and passes over a hilly tract, which seems to run across from the hills on the east to those on the west, and is called by the natives *Tsambu-toung* (the *Mount Samu* of the maps). This transverse ridge evidently forms the southern limit of the *Hukong* valley, and streams flow from it both to the north and south; the former making their way to the *Khyendwen*, and the latter to the *Mogaung* river.

"*Tsambu-toung*," says Captain HANNAY, "is covered with noble trees, many of which, I think, are sàl, and are of immense height and circumference. The tea-plant is also plentiful, besides a great variety of shrubs which are quite new to me. The rays of the sun seem never to penetrate to the soil of *Tsambu-toung*; it may therefore be easily imagined how damp and disagreeable it is, more particularly as there is a peculiar and offensive smell from a poisonous plant which grows in great abundance in this jungle, and the natives tell me that cattle die almost immediately after eating it."

On the 30th the party descended from the encampment on the northern face of this ridge, to the Singpho village of *Walobhum*, and finally encamped on the left bank of the *Edikhyoung*, about three furlongs distant from *Meinkhwon* or *Mungkhum*, the capital of the *Hukong* valley, "where," says Captain HANNAY, "our journey must end for the present; as, besides having no provisions, the men composing the force are so completely worn out with fatigue, that I am certain they could not proceed further without a halt of some days." This interval Captain HANNAY assiduously employed in collecting information regarding the valley, which had from a very early period been an object of great geographical interest, as the site of the *Payendwen* or amber mines, and at no very remote era probably formed

the bed of an alpine lake, which, like that of the *Manipur* valley, has been subsequently raised to its present level by long continued alluvial deposits, and detritus, from the hills which encircle it on every side. The tendency of every such deposition is to raise the level of the water, and facilitate its drainage, until it becomes so shallow, that evaporation suffices to complete the process, and render the soil a fit abode for future races of men. The numerous and extensive lakes in the mountainous regions of *Thibet* and *Tartary* are doubtless undergoing a similar change, and no great stretch of imagination is necessary to anticipate the period when they will become the sites of extensive towns and villages, and present a striking contrast to the rugged magnificence and solitary grandeur of the snowy regions which surround them.

"The valley of *Hukony* or *Payendwen*," says Captain Hannay, "is an extensive plain, bounded on all sides by hills ; its extent from east to north-west being at least 50 miles, and varying in breadth from 45 to 15 miles, the broadest part being to the east. The hills bounding the valley to the east are a continuation of the *Shuedoung-gyi* range, which is high, commences at *Mogaung*, and seems to run in a direction of N. 15 E." The principal river of the valley is the *Numtunaee* or *Khyendwen*, which flows from the *Shuedoung-gyi* range, and after receiving the contributions of numerous small streams quits the valley at its north-western corner, and again enters the defiles of the hills, beyond which its course is no longer perceptible. On the western side of the valley there are but few villages, and these thinly inhabited, the capital itself containing not more than thirty houses ; but the north and eastern sides are said to be very populous, the houses in those quarters being estimated at not less than 3000, nearly all of which are situated on the banks of the *Towang* and *Debee* rivers. All the low hills stretching from the western foot of the *Shuedoung* range were under cultivation, and the population is said to extend across to the banks of the *Irawadi*, in numbers sufficient to enable the Singphos when necessary to assemble a force of nine or ten thousand men.

"With the exception," says Captain Hannay, "of the village of *Meinkhwon*, which has a Shan population, the whole of the inhabitants of the valley are Singphos and their Assamese slaves. Of the former, the larger proportion is composed of the Mrip and Tisan tribes, with a few of the Laphai clan, who are still regarded as strangers by the more ancient colonists, and can hardly be viewed but with hostile feelings, as this tribe have frequently ravaged *Meinkhwon* within the last six years, and were guilty of the still greater atrocity of burning a priest alive in his *kyoung* or monastery.

Formerly, the population was entirely Shan, and previous to the invasion of *Assam* by the Burmese, the town of *Meinkhwon* contained 1500 houses, and was governed by the chief of *Mogaung*. From that period, the exactions of the Burmese officers have led to extensive emigration, and to avoid the oppression to which they were hourly exposed, the Shans have sought an asylum in the remote glens and valleys on the banks of the *Khyendwen*, and the Singphos among the recesses of the mountains at the eastern extremity of the valley. This state of affairs has led to general anarchy, and feuds are constantly arising between the different tribes, which the quarrel of the Beesa and Dupha Gaums has greatly contributed to exasperate. No circumstance is more likely to check these feuds, and reclaim the scattered population of the valley, than the establishment of a profitable commercial intercourse with the more equitably governed valley of *Assam*, with which communication is now becoming more intimate than at any previous period.

Of the mineral productions of the *Hukong* valley, enumerated by Captain HANNAY, the principal are salt, gold, and amber : the former, he informs us, is procured " both on the north and south sides of the valley, and the waters of the *Namtwonkok* and *Edi* rivers are quite brackish from the numerous salt springs in their beds. Gold is found in most of the rivers, both in grains and in pieces the size of a large pea. The rivers which produce it in greatest quantity and of the best quality are the *Kapdúp* and the *Namkwùn* : the sand of the former is not worked for this mineral, I am told, but large pits are dug on its banks, where the gold is found, as above mentioned. Besides the amber, which is found in the Payen-toung, or amber mine hills, there is another place on the east side of the valley called *Kotah-bhum*, where it exists in great quantities, but I am informed that the spot is considered sacred by the Singphos, who will not allow the amber to be taken away, although it is of an inferior description." Specimens of coal, were also found by Captain HANNAY in the beds of the *Numbhyu* and *Edi* rivers ; and he learnt from the natives that, in the *Numtarong*, a great quantity of fossil wood was procurable.

In its relation to *Assam* and *China*, the trade of the *Hukong* valley naturally attracted a share of Captain HANNAY'S attention, and from his account it appears that " the only traffic of any consequence carried on in this valley is with the amber, which the Singphos sell to a few Chinese, Chinese-Shans, and Chinese Singphos, who find their way here annually. The price of the common or mixed amber is $2\frac{1}{2}$ ticals a vis or four rupees per one and a half seer: but the best kind and what

is fit for ornaments, is expensive, varying in price according to its colour and transparency*."

"The Chinese sometimes pay in silver for the amber, but they also bring with them warm jackets, carpets, straw hats, copper pots, and opium, which they give in exchange for it. They also barter their merchandize for ivory and gold dust, but only in small quantities. A few individuals from the Burman territories likewise come here, with cloths of their own manufacture, and also a small quantity of British piece goods for sale. But as they are obliged on their way hither to pass through the country of the most uncivilized of the Kakhyen tribes, they seldom venture to come. The greatest part therefore of British and Burman manufactures which are used in this valley, are brought from *Mogaung* by Singpho merchants. But I understand that within the last few years, several of them have gone to *Assam* with gold dust, ivory, and a little silver, for which they receive in return muskets, cloths, spirits, and opium. The following is a list of British piece goods now selling at *Meinkhwon*—common book-muslin used as head dresses, 14 rupees a piece; coarse broad cloth worn as shawls, 2½ yards long, 18 rupees each; good cotton handkerchiefs, 4 rupees a pair; and coarse ones, 2½ rupees a pair. These are the prices of goods bought at *Ava*, but what similar articles from *Assam* may cost, I cannot ascertain. The broad cloth, however, that I have seen from the latter place is of a very superior quality. The merchants who come to this valley from the Burman territories are natives of *Yo*, and the man who is now selling goods here has frequently visited *Calcutta*. The dress worn by the *Singphos* of this valley is similar to that of the Shans and Burmans of *Mogaung*, but they frequently wear jackets of red camlet, or different velvets which they ornament with buttons, and those who can afford it wear a broad-cloth shawl. The arms in common use amongst them are the *dhu* (or short sword) and spear. The women wear neat jackets of dark coarse cotton cloth, and their *thamines* or petticoats are full and fastened round the waist with a band, being altogether a much more modest dress than that worn by the Burman women. Those who are married, wear their hair tied on the crown of the head like the men, but the younger ones wear theirs tied close to the back of the neck, and fastened with silver pins—both married and single wear white muslin turbans. The ornaments generally worn by them are amber ear-rings, silver bracelets, and necklaces of beads, a good deal

* Specimens in matrice are deposited in the Society's Museum,—Ed.

resembling coral, but of a yellowish colour, and these are so much prized by them that they sell here for their weight in gold."

During his stay at *Hukong*, Captain Hannay was visited by many Singphos from the borders of *China*, from whom he learnt that the *Sginmaekha* river rises in the mountains bounding the plain of *Khanti* to the north, and is inclosed on the east by the *Goulang-sigong* mountains, which they consider the boundary between *Burmah* and *China*. This river is, on the same authority, pronounced not to be navig able even for canoes, and the most satisfactory confirmation is afforded of the accounts of Captain Wilcox*. Several smaller streams fall into the *Sginmaekha* from the *Shuedoung-gyi* hills on the west, and the name of *Situng* is given to the tract of country through which they flow. In this district gold is very plentiful, and it is found, says Captain Hannay, " over the whole tract of mountainous country, above the *Sginmaekha*. The Chinese visit this locality for the purpose of procuring the gold, and give in exchange for it, warm clothing, carpets and opium."

Of the several routes by which communication is kept up between the inhabitants of *Hukong* and the countries around, the principal appear to be, one leading across the *Shuedoung-gyi* range to the eastern Singphos; a second, called the *Lye-gnep-bhum* road, winds round the base of the mountain of that name, and leads in sixteen days to *Mung-lang*, the capital of the *Khanti* country, which was visited by Captain Wilcox.

The most important one, however, with reference to trade, lies in a south-east direction from the *Hukong* valley, from which the district of *Kakyo-wainmo* is not more than eight days' march distant. By this route the Chinese frequently travel, and it affords a very satisfactory proof that intercourse may be held direct with *China*, without the necessity of following the circuitous route by *Mogaung*.

Among the several races of people inhabiting the valleys through which the principal rivers flow, the Khantis or Khumptis hold a very conspicuous rank: they are represented as a fine, brave, and hardy race of men, and are held in great apprehension by the Burmahs, who, about three years ago, attempted to raise revenue amongst them: the force detached on this duty, however, met with such determined resistance, that it was compelled to return, and no subsequent attempt has

* Although Captain Wilcox (As. Res. vol. xvii. p. 463), relying on the accounts given by Singphos of this river, appears to have formed rather an exaggerated estimate of *its size*, his conjectures as to the position of *its sources* are fully verified by the statements made to Captain Hannay.—R. B. P.

been made on their independence. They are in constant communication with the Khunungs, a wild tribe inhabiting the mountains to the north and east, from whom they procure silver and iron. "The former is found in a mine, said to be situated on the northern side of the mountains, to the north-east of *Khanti*." All the information Captain Hannay could obtain led him to suppose that this mine was worked by people subject to *China*, and from the description given, he thinks they are Lamas, or people of *Thibet*. The part of the Chinese territories north-east of *Khanti* is known at *Hukong* by the name of *Mungfan**, and the Khantis have no communication with it but through the Khunungs.

From *Meingkhwon*, Captain Hannay obtained a view of the hill, near which lie the sources of the *Uru* river, one of the principal affluents of the *Ningthi* or *Khyendwen:* it bore south 35° west from *Meingkhwon*, and was about 25 miles distant. It is in the vicinity of this spot that the most celebrated mines of serpentine are situated, and their position is thus described by Captain Hannay.

" A line drawn from *Mogaung* in a direction of N. 55 W. and another from *Meingkhwon* N. 25 W. will give the position of the serpentine mine district. The Chinese frequently proceed to the mines by water for two days' journey up the *Mogaung* river, to a village called *Kam-mein*, at which place a small stream called *Engdau-khyoung*, falls into the *Mogaung* river. From thence a road leads along the *Engdau-khyoung* to a lake several miles in circumference called *Engdau-gyi*, and to the north of this lake eight or nine miles distant are the serpentine mines. The tract of country in which the serpentine is found extending 18 or 20 miles." There is, however, another more direct route from *Kam-mien* which runs in a north-westerly direction. The whole tract of country is hilly, and several hot and salt springs are reported to exist near the *Engdau-gyi* lake, which is said to cover what was once the site of a large Shan town called *Tumansye*. The natives affirm that it was destroyed by an earthquake, and from the description given of a hill in the vicinity, the catastrophe may have been produced by the immediate agency of volcanic action.

On the 21st of March, Captain Hannay visited the amber mines,

* In the second volume of Du Halde's "China," p. 385, the Père Regis thus describes the tribe by which this tract of country is inhabited, and its geographical site:

"The most powerful among the Tartar Lamas are those called by the Chinese *Moong-fan*, who possess a wide territory in *Tibet*, north of *Li Kyang-lu-fu*, between the rivers *Kincha-kyang* and *Vu-lyangho*. This country was ceded to them by Usanghey (whom the Manchews made king of *Yunan*) to engage them in his interest."—R. B. P.

and his description is the first that has ever been given of the locality from whence the Burmans obtain this mineral.

"We set out at eight o'clock," he says, "in the morning, and returned at two P. M. To the foot of the hills the direction is about south 25 west, and the distance three miles, the last mile being through a thick grass jungle, after which there is an ascent of one hundred feet, where there is a sort of temple, at which the natives, on visiting the mines, make offerings to the ngats or spirits. About a hundred yards from this place, the marks of pits, where amber had been formerly dug for, are visible, but this side of the hill is now deserted, and we proceeded three miles further on to the place where the people are now employed in digging, and where the amber is most plentiful. The last three miles of our road led through a dense small tree jungle, and the pits and holes were so numerous that it was with difficulty we got on. The whole tract is a succession of small hillocks, the highest of which rise abruptly to the height of fifty feet, and amongst various shrubs which cover these hillocks the tea plant is very plentiful. The soil throughout is a reddish and yellow coloured clay, and the earth in those pits, which had been for sometime exposed to the air, had a smell of coal tar; whilst in those which had been recently opened, the soil had a fine aromatic smell. The pits vary from six to fifteen feet in depth, being, generally speaking, three feet square, and the soil is so stiff that it does not require propping up."

"I have no doubt," Captain HANNAY adds, "that my being accompanied by several Burmese officers, caused the people to secrete all the good amber they had found. For although they were at work in ten pits, I did not see a piece of amber worth having. The people employed in digging were a few Singphos from the borders of *China* and of this valley. On making inquiry regarding the cause of the alleged scarcity of amber, I was told that, want of people to dig for it was the principal cause; but I should think the inefficiency of the tools they use was the most plausible reason:—their only implements being a bambu sharpened at one end, and a small wooden shovel."

"The most favorable spots for digging are on such spaces on the sides of the small hillocks as are free from jungle, and I am told that the deeper the pits are dug, the finer the amber; and that that kind which is of a bright pale yellow, is only got at the depth of forty feet under ground."

A few days subsequent to this examination of the amber mines, Captain HANNAY visited the *Numtunaee* or *Khyendwen*, which flows through the valley about five miles north of *Meingkhwon* in this part

of its course; and at this season of the year the stream, as might have been anticipated, is small, but in the rains Captain Hannay estimates that its breadth must be 300 yards from bank to bank, and it is navigable throughout the year for large canoes. An island in the centre of the bed was covered with the skeletons of large fish, which had been destroyed by the poisonous quality of the fallen leaves of overhanging trees:—the natives eat the fish so killed with impunity.

After waiting several days at *Meingkhwon*, in anticipation of the return of some messengers who had been sent into *Assam*, and suffering extreme inconvenience from the difficulty of procuring adequate supplies for the force, the Myo-wun began seriously to think of returning to *Mogaung*. All expectation of prosecuting the journey into *Assam* had been relinquished, and the Dupha Gaum having voluntarily come into the camp, was received by the Burman governor with a civility and distinction, extorted by his apprehension of the numerous Singphos ready to support their redoubtable chieftain, whose influence is said to extend to the frontiers of *China*. On the first of April the ceremony was performed of swearing in the different Tsobuas (tributary chiefs) to keep the peace, which is thus described by Captain Hannay.

"The ceremony commenced by killing a buffalo, which was effected with several strokes of a mallet, and the flesh of the animal was cut up to be cooked for the occasion. Each Tsobua then presented his sword and spear to the spirits of the three brother Tsobuas of *Mogaung*, who are supposed to accompany the governor of the above named place, and to inhabit three small huts which are erected on the edge of the camp. Offerings of rice, meat, &c. were made to these *ngats* or spirits, and on this being done, each person concerned in taking the oath received a small portion of rice in his hand; and in a kneeling posture, with his hands clasped above his head, heard the oaths read both in the Shan and Burmese languages. After this, the paper on which the oaths were written was burned to ashes, and mixed with water, when a cup full of the mixture was given to each of the Tsobuas to drink, who, before doing so, repeated an assurance that they would keep the oath, and the ceremony was concluded by the chiefs all sitting down together and eating out of the same dish." The chieftains to whom this oath of forbearance was administered were the Thogyee of *Meingkhwon*, a Shan—the Dupha Gaum, a *Tesan* Singpho—the Panwah Tsobua, a *Laphaee* Singpho—the Situngyen Gaum, and Weng-keng-moung, *Mirip* Singphos—and Tare-poung-noung, a *Tesan* Singpho,—all of whom, by this act, virtually acknowledged the supre-

macy of the Burman authorities, and their own subjection to the kingdom of *Ava.*

The new governor having succeeded by threats and the practice of every art of extortion, in raising as large a sum as it was possible to collect from the inhabitants of the valley and surrounding hills, announced his intention of returning to *Mogaung*; and on the 5th of April no intelligence having been received from *Assam,* Captain Hannay left *Meingkhwon* on his return to *Ava,* with a very favorable impression of the Singphos he had seen, who appear to possess great capabilities of improvement, and whose worst qualities are represented as the natural result of the oppressive system of government under which they live. One of their chieftains in conversation with Captain Hannay furnished a clue to the estimation in which they held the paramount authorities around them by the following remark. "The British," he said, "are honourable, and so are the Chinese. Among the Burmans you might possibly find one in a hundred, who, if well paid, would do justice to those under him. The Shans of *Mogaung,*" he added "are the dogs of the Burmans, and the Assamese are worse than either, being the most dangerous back-biting race in existence."

On the 12th of April, Captain Hannay reached *Mogaung,* and some boats arriving shortly afterwards from the serpentine mines, he availed himself of so favorable an opportunity of acquiring some additional information regarding that interesting locality. He found the boats laden with masses of the stone so large, as to require three men to lift them. The owners of the boats were respectable Chinese Musalmáns, who were extremely civil, and readily answered all the questions put to them by Captain Hannay, who learnt "that, although the greater number of Chinese come by the route of *Santa* and *Tali,* still they are only the poorer classes who do so: the wealthier people come by *Bamo,* which is both the safest and the best route. The total number of Chinese and Chinese Shans who have this year visited the mines is 480."

"I have made every inquiry," adds Captain Hannay, "regarding the duties levied on these people, both on their arrival here and on their purchasing the serpentine, and I am inclined to think that there is not much regularity in the taxes, a great deal depending on the value of the presents made to the head-man. Formerly, the Chinese were not allowed to go to the mines, but I understand the following is now the system carried on in this business.

"At particular seasons of the year, there are about 1000 men em-

ployed in digging for serpentine: they are Burmahs, Shans, Chinese-Shans, and Singphos. These people each pay a quarter of a tical a month, for being allowed to dig at the mines, and the produce of their labour is considered their own.

"The Chinese who come for the serpentine, on their arrival at *Mogaung*, each pay a tax of from 1½ to 2½ ticals of silver, for permission to proceed to the mines, and 1½ ticals a month during their stay there. Another duty is levied on the boats or ponies employed in carrying away the serpentine, but this tax varies according to circumstances; and on the return of the Chinese to *Mogaung*, the serpentine is appraised and a tax of 10 per cent. taken on its value. The last duty levied is a quarter of a tical from every individual, on his arrival at the village of *Tapo*, and there the Chinese deliver up all the certificates they have had, granting them permission to proceed to the mines."

On the 9th of April, no intelligence having been received of the messengers sent into *Assam*, Captain Hannay determined to return to *Ava*, and, embarking on a small boat, he reached *Bamo* in eight days, and arrived at *Ava* on the 1st of May. The time occupied in returning from *Meingkhwon* to *Ava* was only eighteen days, while the journey to that frontier post was not completed in less than forty-six of actual travelling,—a very striking proof of the extreme difficulty of estimating the distance between remote points, by the number of days occupied in passing from one to the other, unless the circumstances under which the journey was made are particularly described. That portion of the route between *Meingkhwon* and *Beesa* in *Assam*, which Captain Hannay was prevented visiting, will probably in a short time be as well known as the territory he has already so successfully explored, and the researches in which he is now engaged, extending from *Beesa* in *Assam* to *Meingkhwon* in the *Hukong* valley, will complete the examination of a line of country not surpassed in interest by any, which our existing relations with the empire of *Ava* have afforded us an opportunity of visiting. His labours have filled the void necessarily left in the researches of Wilcox, Burlton, and Bedford, and have greatly contributed to dispel the doubt and uncertainty, which they had not the opportunity of removing. While the officers of the *Bengal* Presidency have been thus successfully engaged in geographical inquiries on the north of *Ava*, the south and western districts have been explored with equal zeal and intelligence by those of the *Madras* Presidency; and the spirit of honorable competition, which has already stimulated the researches

of Drs. RICHARDSON and BAYFIELD, and Lieutenant MACLEOD, with such marked advantage, bids fair, in a comparatively short time, to render the whole empire of *Ava* better known than the most sanguine could have ventured to anticipate. Did the results of such journies and investigations tend only to an increase of our geographical knowledge, they would even then be most valuable : but to suppose that the consequences of this intercourse between intelligence and ignorance are so limited, is to take a most inadequate view of the subject: the confidence inspired by the visits and conduct of a single individual,* has already opened a communication between *Yunan* and *Moulmein*, and the caravans of *China* have commenced their annual visits to the British settlements on the coast: the journey of Captain HANNAY will in all probability lead to a similar result between *Assam* and the northern districts of *Yunan*; and the time may not be very distant, when British merchants located at *Bamo*, will, by their superior energy and resources, extend its now restricted trade to surrounding countries, and pave the way for ameliorating the condition and enlightening the ignorance of their numerous inhabitants.—*Journal of the Asiatic Society of Bengal* pp. 245-278.

4.—*Report on the Physical Condition of the Assam Tea Plant, with reference to Geological Structure, Soils, and Climate.—By* JOHN M'CLELLAND, *Esq., Assistant Surgeon, Bengal Establishment, and Member of the Asiatic and Medical Societies of Calcutta.—Presented to the Agricultural Society of Calcutta, 8th February,* 1837, *by desire of the Right Honourable Lord* AUCKLAND, *Governor General of India, &c. &c. &c.*

[We have been favoured by the talented author with an able pamphlet under the above title, which has been printed in Calcutta as the first fasciculus of the 4th vol. of the *Transactions of the Agri-Horticultural Society*. We have abridged it to suit our pages.—ED.]

Geology.—Approaching the Kossia mountains, I observed small insulated knolls projecting abruptly out of the low marshy plains by which they are surrounded. They are seen extending along the base

* DR. RICHARDSON of *Madras.*—R. B. P.

of the mountains as far as the eye can reach, and proved to be the remains of a former talus, from the fact of the summits of some of them being composed of coarse pebbles and boulders.

The acclivity of the Kossia mountains facing these knolls, may, without any great inaccuracy be divided into three stages. The first a rugged, but gentle slope to the height of about 1500 feet; the second precipices, and the third a succession of summits. Extending along the top of the first stage, and at the base of the second, I found the well marked remains of a raised beach, characterised by a deposite of marine shells, twenty-five species of which, I have identified with an equal number of species comprised in a small collection of fossils from the Paris Basin, presented to the Asiatic Society of Bengal by Mr. Christie. The smallness of Mr. Christie's collection, consisting only of about 150 species, prevents me at present from establishing perhaps, a much more extensive agreement between the tertiary remains of these two remote localities.

Descending at another point, ten miles to the westward of this situation, I found at about the same altitude, a continuation of the line of organic remains; but the fossils were here grouped together in distinct families, as is observed to be the case in the subappennine deposites. I have procured sufficient materials from these beds to enable me to establish their nature, as soon as I am provided with the means of comparing them with the fossils of other tertiary groups which have been examined in Europe.

Without dwelling farther at present on the geology of the Kossia mountains, I shall merely observe that their agricultural character appears to improve much after crossing the valley of the Boga-pany. Previous to that, the surface being composed of horizontal strata, is barren, and without soil except in ravines; but at Muflong, where the rocks become inclined, a fine rich soil is abundantly retained on their surface, while the ravines afford an iron sand, in more than sufficient quantity for all the purposes for which the metal is required in the neighbouring country; but the ore is not found in sufficient quantity to render it an object of that importance, which it otherwise would be, in the vicinity of such extensive repositories of coal as here occur.

Should it be thought desirable to give the tea plant a trial in the Kossia mountains, I would recommend a situation at the western extremity of the valley of Myrung, where the soil is derived from a granular foliated felspar, very similar to the rock that affords some of those tea soils, which have been collected in China.

But for the circumstances of the raised beach, as well as of the dis-

coveries of the late Mr. Scott, at the Colibaree hills, Assam would present itself as an instance of a great valley of denudation. This would also be supposed to be the case, if the mountains on the two opposite sides possessed any characters in common. Porphyry, primitive lime-stone, serpentine, granite, and talcose slates, compose the mountains on the northern side of the valley, while tertiary sand-stones, shell lime-stone, and coal, compose the southern group; in conjunction with metamorphosed gneiss, green-stone, and sienite.

Here then we have two distinct systems, with the valley of Assam interposed between them. The valley contracts towards its outlet, to a breadth of only twenty miles in Lower Assam; but in Upper Assam, its breadth is probably fifty miles. In Lower Assam the breadth of the valley is still farther contracted by a small system of hills given off from the mountains on the south; through these hills, the Bramaputra flows with a pretty uniform current, at the rate of about three miles an hour.

At Gowahatti the Mekeer hills, as they are called, are composed of metamorphosed gneiss, consisting of quartz injected into felspar from below, and containing beds of mica. In other places sienite, also containing veins and masses of quartz occurs; and at Goalpara, horn-blende containing concretions of felspar, constitute the rocks in the immediate vicinity of the river.

At Noagong the rocks composing a portion of the Mekeers, called Solano, are of a magnesian nature, including lenticular masses of the size of large boulders, of granular and compact quartz, and pebbles of various kinds imbedded in a fine, curved, slaty matrix, and the whole arranged so as to represent the figure of an irregular volcanic cone; near which, in the open plain, an insulated accumulation of granitic masses form a mound of twenty or thirty feet high. Whether these granitic masses were propelled from below, or projected from a volcano, I had no means of determining during my hasty visit to the spot; but they possess no common character with the other rocks in the vicinity, that I saw.

Without entering farther into particulars at present, I think it will be conceded, that Assam is not a valley of denudation, and that the mountains on either side not only belong to perfectly distinct epochs, but that Lower Assam has itself been subject to very considerable disturbances, the effect of which has been to raise the general level of this part of the surface, by which means the waters in the interior were confined for a short time, until the accumulation of silt obliterated the depression within.

Upper Assam, as may be expected from these views, is an extensive alluvial basin; regarding which, much depends on the accuracy of our general and particular observations, as it brings us at once to the main object of enquiry—the history of the tea plant and the circumstances in regard to soil under which it exists.

In considering the extent and nature of this basin, we are at once struck with the peculiarity of a perfect plain about eighty miles long, and forty broad, surrounded by lofty mountains and invaded by four enormous rivers, besides six or seven smaller ones, the least of which is as large as the greatest river in England.

These streams are so many great channels, by which nature conveys into the valley, the productions of the mountains; and it is only necessary to mention the direction from whence a few of the principal streams are derived, in order to be prepared to find, in the natural history of this romantic and singular spot, a greater variety of objects than a similar extent of any less peculiar situation could be expected to afford.

The first of these great rivers is the Dihong, which enters the valley by a narrow defile in the Abor mountains about twenty-five miles N.W. of Suddyah. Every circumstance seems combined to render the Dihong liable to sudden, or at least excessive periodical inundations, its hydrographical basin extending amidst snows, parallel to the equator from the 82° to the 93° of longitude, along the elevated plateau of the Himalaya.*

The first rise of this river takes place in the beginning of March, and amounts to about fifteen feet, said to be occasioned by the melting of the snow. Towards the middle of April, there is a general subsidence of about ten feet, and the river retains something more than its ordinary level, until the periodical rains set in, when the inundations commence, the river then begins to rise at Gowahatti, where it attains in July and August a height of forty feet above its level during the dry season.

The second great branch of the Bramaputra—the Dibong, enters the valley by a similar defile to that of the Dihong. Between the defiles of these two rivers, which are not above 15 miles apart, there is a remarkably abrupt and picturesque mountain, terminating in three peaks, on the highest of which snow lies for two-thirds of the year. The source of the Dibong is unknown, but it must approach, if it does not

* According to Malte Brun the peculiarity of the inundations of the Nile depends on its course being extended from east to west within the tropics. The inundations of such rivers are higher but less sudden than those of rivers running parallel to the meridian like the Suban-Shireee.

pass within, the mountains on the frontier of China. It forms the natural boundary between the Abor, and the Mishmee tribes.

The third branch of the Bramaputra, is that which retains the name of the great river, from its falling straight into the axis of the main trunk, from the opposite, or eastern extremity of Assam. It enters the valley by a series of cascades, it is said, rather than by a deep defile: and indeed this peculiarity is distinguished at a distance of thirty miles, by the accumulations of rolled stones which have been propelled forward, causing a succession of rapids which gradually increase in number and difficulty. This river, after its entrance into the valley, receives the Digaroo and Kondul rivers from the Mishmee mountains on the north, and the Noa Dihing and Tenga from the south-east. For reasons to be afterwards assigned, it will be well to keep the direction of the two last named rivers in view.

The fourth great branch of the Bramaputra, called Suban-Shieree, takes its origin, it is supposed, in Thibet; and enters Assam from the north, below the junction of the other great branches, and at right angles with the great fluviatile trunk. From its southerly direction, and the peculiarity of its source in the snows of an elevated chain, from which it descends transversely, the inundations of this river take possession of Assam, previous to those of the other rivers. The silt which its floods convey into the valley (where they spread and lose their impetuosity), is consequently deposited so as to impede the course of the Bramaputra. The great stream is thus caused to diverge from its direct course, and from time to time to force its way, by the bursting of new channels. Between two of these at present, an island, sixty miles long and ten broad, is formed at the confluence of the Suban-Shieree, chiefly by its silt.

It has now been shewn that Upper Assam is an alluvial basin, formed by the confluence of various great rivers, which flowing from opposite directions, meet in its centre. I have been unable to determine whether the original surface underwent any subsidence of its former levels, or whether the elevation of the rocks in Lower Assam was the only cause of the production of the basin. The total absence of any rocky protrusions through the alluvium, and the general levels relatively, between Upper and Lower Assam, as well as Bengal, being only such as to afford an ordinary current of about two miles or three an hour, indicate a depression of the older rocks in Upper Assam. More extensive observations, and experiments in boring, can alone determine this point.

The rivers as they fall into the valley, precipitate such portion of

their contents as their waters from diminished velocity are unable to convey further. This has occasioned a succession of low rounded sand hills, which are particularly to be observed on the south eastern side of Assam, at the tea localities of Cuju, and Nigroo where from the rapidity with which the Noa Dihing and Bora Dihing, fall into the valley, such accumulations are most to be expected.

There is consequently a general inclination of the surface, in this direction, extending from the main fluviatile trunk, to the foot of the mountains. Along this descent, the Debru, Bora Dihing and Disung rivers flow in very indolent currents from the S. E. where they take their rise, except the first, in the Naga mountains. If we add to these rivers a small stream which rises in a southerly direction, in the same mountains near Gubru-purbut, we have an accurate definition of the limits of the tea plant in Upper Assam.

Cuju, one of the places in which we found the tea plant, is situated at the source of the Debru; Tingrai, another tea locality, is on the bank of one of its tributaries; and Noadwar, a third situation at which we found the plant, is in a tract subject to the inundations of the same river; and we heard of its existence at Cherrabie, in still closer connexion with this stream.

At the source of one of the tributaries of the Bora Dihing, we examined the tea plant near the village of Nigroo; and heard of its existence at the extreme branch of that river, in hills twenty miles south-east of Nigroo.*

We have also positive information of the existence of the plant, at Borhath, near the foot of the Naga mountains, and close to the source of the Disung; but circumstances prevented our visiting either of the three last mentioned places.

Of the different streams just noticed, whose banks afford localities of the tea plant, the Debru, if not the most interesting, is at least the one with which we are best acquainted. It rises in the sand hills, or undulating country between the Bora Dihing, and Noa Dihing rivers, and derives its first waters from springs situated between the sand and clay deposites. The stream is languid, and not such as to indicate any great difference of level throughout its course, which is about sixty miles in a N. W. direction, but its banks near its source are from twenty to thirty feet high, and the surrounding country is

* The colony of plants alluded to is situated at Namroop; many of our attendents had been there and saw the plant.

dry; while the very reverse obtains in the middle of its course, and from thence to its confluence with the Bramaputra.

During the few excursions we made into the interior, I found other transformations of the original surface of the country, referrible to artificial, rather than to natural causes: such for instance as extensive embankments, raised as fortifications in remote times, when the resources and population of the country must have been in a far different state from what they are in at present. But the remains, in Upper Assam, of such works as are here alluded to, have an interest of another description in this enquiry, distinct from what they would afford to the antiquary.

When we find those artificial embankments, or tumuli, extending for miles through the most deserted tracts of Assam, raised often to the height of 20 or 30 feet above the plain, and overgrown with ancient forest trees; as large as those amidst which the colonies of wild tea plants are found, the question is at once suggested—"May not these colonies of wild plants, have been cultivated gardens, into which the plant was introduced artificially?" A doubt would be thus cast at once upon the indigenous nature of the tea plant, and though it may have since propagated and grown spontaneously for ages, yet the chances against its successful cultivation for commercial purposes would perhaps in consequence be increased.

Farther arguments might be adduced in support of this view, by referring to the antiquities of Assam; which are both extensive and decisive as to the former existence of such a state of society in regard to refinement, as would lead us to conclude that the luxuries of neighbouring countries (and the tea plant among the rest), were probably artificially introduced.*

* At Teespore, near Bishenath, on an eminence by the river side, the surface to the extent of an acre is covered with architraves, cornices, pilasters, columns, and all the essential parts of a splendid building, carved in granite. The ornaments present a mixture of Saracenic and Roman styles. The stones do not agree in their nature with any of the rocks in the vicinity; and from the way in which they are strewed, as well as from the freshness of their angles, would never appear to have been used. Temples of Hindoos are numerous, and about Gowahatti, some of them are very extensive and more elegant than I had previously seen in any part of India. Those that excel most in every respect are the most ancient, and are built of granite. Many of the insulated hills in Lower Assam have their masses sculptured in situ representing gigantic figures in bas-relief; and as such monuments are referred to Buddhists of early date, they prove, that the masses on which they have been marked, have undergone no general change in very recent times, although they do present some signs of the disturbing influence of earthquakes, which are said to be here frequent and severe.

On the other hand, it may be observed in favour of the indigenous nature of the plant, in Upper Assam, that it is not found beyond the bounds of the alluvial basin ; so that we must ascribe to the latter, some natural influence to which we are indebted for the possession of this plant ; as such restriction appears to me to be dependant only on natural causes, which do not alone affect this species, but also various others in both kingdoms of organic nature in like manner.

The plant is traced along the course of the small rivers which enter the valley from the south-east, in a series of distinct colonies ; rendering it probable that the seeds have been transmitted forward along the course of the currents. It is not necessary that the seeds should have been conveyed at once down the current of any one of these streams from a great distance into the valley, or to suppose that their vegetative principle could survive submersion in a current for any length of time without injury. It is enough, that a single seed may have fallen from a Chinese caravan, near the source of one of those fluviatile ramifications which converge to the valley, on every side, over 18° long. and 4° lat., where it may have been deposited under circumstances favourable to its growth and propagation. A colony would thus be established, from which thousands of seeds might be annually transmitted, and although ten thousand of these might be lost, still one of them might be drifted during a flood along the banks of a stream; and deposited under circumstances favourable to the establishment of an advanced colony, and so on.

This view of the way in which the tea plant performed its migrations into Assam is not merely theoretical, as it occurred first from facts which were presented to me, during an examination of the tea colony at Tingrai, as will be afterwards shewn.

The next object is, to inquire whether we have any proof of the direction from whence the plant has been conveyed into the valley. It is necessary to call to mind that Assam is divided from the east to west, by the Bramaputra ; and that in the northern section of the valley thus formed, no tea colonies have hitherto been found, hence the plant would not appear to have been introduced from countries in that direction ; nor did Mr. Griffith find any trace of it in the Mishmee mountains, or even that the Mishmee tribes have any knowledge of it whatever.* On the other hand, a Kamtee of rank, named Chi-long-fu, residing at Suddya, informed the Deputation that in all those countries to the eastward of Assam, tea is used at meals instead of water, and

* Letter to the Tea Committee.

that during the hot season, it is the only drink of those who can afford to procure it—that it is drank at meals by people in good circumstances, and that the poor have it only at feasts, because they cannot procure it at other times. He also informed us, that it is by the common people of those countries with which he himself is connected, the general offering made to great men on visits of ceremony, when compliments are intended to be paid. It is cultivated, he says, in gardens; and plantations are reserved for the purpose of procuring it, and that the expense is equal to about one anna for two pounds weight. When preparing it for use this quantity is placed at once in a large vessel from which individuals of the party help themselves.

He farther assured us, that the tea thus universally used, is identically the same as the wild plant now growing in Assam, and that it is prepared by all the nations east of Suddya, with which he is acquainted, just in the way that it is now prepared by the Singphos, whom it was then supposed we were about to visit.

He said it was cultivated in gardens and plantations for convenience, and for the purpose of keeping up a sufficient supply, rather than from an idea of improving its quality beyond that of the wild tea plant. In their plantations, he informed us, they did not interfere with the growth of the tree, farther than by depriving it of the leaves for which it is cultivated. It consequently attains such a size as to oblige those who collect the leaves to climb upon the branches.

This is the substance of the information we derived from a person of weight, and some political influence at Suddya; but whether it is of much value in the elucidation of the question of the cultivation and manufacture of the Assam tea plant, I shall not at present venture an opinion: but this information, and certain physical indications regarding the direction from whence the plant originally approached the valley, are mutually in confirmation of each other. Thus we have still an extreme eastern depôt of plants at Namroop, the source of the Bora Dihing river. From this, Nigroo may have been directly supplied; but Cuju, as it presents the largest plants, I suspect to be the oldest colony of which we have any description, in the valley; and situated at the source of the Debru river, it is certainly the parent of all those colonies which have been discovered along the banks of that stream.

Topography, Structure, and Soils of the Tea Colonies.—The village of Cuju is situated about twelve miles from the banks of the Noa Dihing river, and twenty miles south of Suddya, in the midst of an extensive forest. It may be approached either by penetrating on elephants directly through the forest from Suddya, or by boats, as far as a spot on the banks of the Noa Dihing, called Cuju gât, from which a foot-path extends through the forest to the village. About half way there is a small settlement of Singphos, consisting of a few families, scarcely numerous enough to justify the term village being applied to their habitations. In their neighbourhood is a patch of ground a little lower than the adjoining forest, appropriated to the cultivation of rice. With this exception the forest is totally uninterrupted from the river to Cuju, where the rice grounds of that village extend over a space of about fifty acres, some two or three feet below the level of the general surface.

The soil of the rice field is in places rich, but superficial, reposing on a grey sandy clay; but generally it is itself grey and clayey. The soil in the forest is however light yellow, and of more sandy consistence than that of the rice grounds, but still of a somewhat clayey texture. We crossed a small stream, the water of which was coloured with what proved on analysis to be oxide of iron. The bed of the stream being sand, we may expect the same process of consolidation to be going on here, as has already been observed in regard to the Noa Dihing.

The site of the village of Cuju, though surrounded by extensive forests, and scarcely elevated above the common level, is drier than any place I had previously seen in Upper Assam. The soil in the village, unlike that of the district generally, is of a rich brown colour, and affords good crops of opium.

The day after our arrival at Cuju, we set out to inspect the colony of tea plants, the first we had ever seen. We descended, soon after leaving the village, into a small depression, which had been cultivated for rice; proceeding about half a mile beyond this, we entered a thick forest, intersected by a small and nearly stagnant stream, the source of the Debru. The ground was somewhat more sandy, than that of the general surface which we had passed over. Pursuing a foot-path that had been recently formed, we came upon low sandy undulations, connected with the former windings of the stream we had just crossed. The sand in places was thrown up into mounds, the highest of which could not be more than twenty feet. After leaving these banks of sand, we had occasion to cross the stream

again; we then entered upon level ground, the soil dark and firm under the feet, covered with grass and a few scattered trees. This was of short extent, as we suddenly entered the forest again and were surrounded by tea plants.

The first remarkable thing that presented itself here, was the peculiar irregularity of the surface; which in places was excavated into natural trenches, and in other situations raised into rounded accumulations at the roots, and trunks of trees, and clumps of bamboos. The excavations seemed as if they had been formed artificially, and were from two, to three, and even four feet deep, of very irregular shapes, and seldom communicating with each other. After many conjectures, I found the size of the excavations bear exact proportion to the size and height of the nearest adjoining trees, and that they never appeared immediately under the shade of large branches. The cause then appeared to be the collection of rain on the foliage of lofty trees; from which the water so collected is precipitated in heavy volumes on the loose and light soil, excavating it in the manner described.

The trenches are from one yard to ten in length, and generally a yard, or two yards wide; and their general figures correspond to the form of the interstices between the branches above. The tea plants are most numerous along the margins of these natural excavations, as well on the accumulations of dry soil raised around the roots of bamboos. The soil is perfectly loose, and sinks under the feet with a certain degree of elasticity derived from dense meshes of succulent fibres, prolonged in every direction from various roots. Its colour is light grey, perfectly dry and dusty, although the surrounding country was still wet, from the effects of rain that had fallen for several days immediately prior to our visit.

Even the trenches were dry, and from their not communicating with each other, it seemed quite evident, that the soil and substratum must be highly porous, and different in this respect from the structure of the surrounding surface of the country.

Extending examinations farther, I found the peculiar character of the soil in regard to colour, consistency, and inequality of surface disappear, with the tea plant itself, beyond the extent of a circular space of about 300 yards in diameter.

It was also to be remarked here as well as in other situations in which the tea plant was afterwards examined, that insulated individuals were smaller in size, the farther they were found detached from the natural limits of the colony; which last were always found to be

marked by certain changes in the soil, except perhaps in a single instance.*

We now continued our journey along a path extending through the forest in the direction of W.S.W., occasionally approaching the banks of the Debru river. The soil in the forest, is similar to that already mentioned. Animals are very few, and consist chiefly of wild elephants; the forest indeed is too damp and shaded to afford a suitable shelter to the animals of Lower Assam, and of the plains of India; and the elephant is perhaps the only creature among the larger animals, who could procure sustenance in such a place. A new species of squirrel (larger than *Sciurus maximus*), which I have named *S. bengmoricus*, seems to be peculiar to this tract. Towards the close of the first day's journey, we crossed a small clear stream running into the Debru on our right; and indicating an elevation of the surface towards the east.

We spent the night in a Singpho village called Cujudoo, and the following day we continued our journey through the forest in a southerly direction. Our path for perhaps five miles, extended along a massive embankment, probably thirty feet high, and overgrown with some of the most ancient trees in the forest. From this we pursued an easterly direction, and after descending from the tumulus, found a tree fern, which I believe proved to be of the same species as that which had been previously found at Cherra-punji. The surface soon became more elevated, and undulating; but still composed of yellow sandy clay. The streams then descended in an opposite, or N. E. direction, running we were told into a river called the Maun; while those we crossed in the early part of the day, run S. W. into the Debru, proving that we had crossed a tract of forest, elevated herhaps about 50 feet above the general plain, with a gradual, or almost imperceptible ascent, and descent, on each side, indicated only by the direction of the rivulets. We then crossed the bed of a small stream of clear water, passing over pipe clay; from thence the white, or yellow sandy clay, over which we had passed ever since we entered the forests, disappeared as well as all undulations; the surface assuming the ordinary character of flatness, to which we had been accustomed, and was chiefly composed of clayey soil, sometimes blue and in places yellow, but without sandy admixture. These appearances continued for a few miles, until we entered the village of Nigroo, on the banks

* I here allude to the western boundary of the upper colony of plants at Tingrai.

of the Bora Dihing river. From thence we entered the bed of a small river which joins the Bora Dihing, called at this place the Maun-moo,* and proceeding up its bed, for the distance of about three miles, reached the second tea colony.

NIGROO.—The soils in which the plant is here found, are of three sorts, each of which differ from that in which it was found to grow at Cuju, but presenting points still more instructive and interesting than the latter colony afforded. The topography of the place, presents to our notice; First, the dry sandy bed of an occasional pond that empties itself by means of a deep drain (said to have been formed by nature, though it looks artificial), extending across the colony of plants, and communicating with the bed of the Maun-moo. Secondly, a mound of tolerably rich, but very light soil, extending in a north easterly direction, and presenting a serpentine declivity to the S. E.

The Maun-moo river partly encircles the spot, giving it the shape of a small peninsula. The level of the river is about 15 feet lower than the surface at the foot of the hillock, or mound, so that during floods the tea plants in the latter situation, must be liable occasionally, (I should think), to slight inundation.

Approaching the spot, from the river, we crossed a zone of almost pure sand, overgrown with reeds, and in the course of a few paces, reached a sandy clayey soil in which we found a few small tea plants; a few steps farther introduced us to a drier, and less consistent soil, in which the plants were found larger, and more numerous. Surrounded by tea plants, we ascended the mound, the soil of whichis light, fine, and of yellow colour, having no sandy character. Here the plants were found still more numerous than in the lower ground.

NOADWAR.—The third tea colony we visited, is near the village of Noadwar, in the centre of Upper Assam, and not above twenty-five, or thirty miles from the Bramaputra.

Proceeding to the spot where the plants are found, we passed over rice grounds which were almost quite under water from the torrents of rain then falling, in the middle of February. Having entered the skirts of a forest which, though not under water, was wet and slippery,

* *Moo,* or *Mokh,* mouth; synonymous with *Moon,* in Bengalee.

and in some places deeply covered with mud; we suddenly ascended from the dry bed of an occasional water course,* and at first sight discovered a total change of soil and vegetation.

From floundering in mud, we now stood on a light, red, dry, and dusty soil, notwithstanding the rain to which it was exposed, in common with every part of the country at the time.

This colony is probably about fifty yards in length and twenty in breadth, and extends along the S. W. brow of the dry channel: the height of the bank on which the tea grows is about five feet. The surrounding low ground is overgrown with reeds, and the higher tracts with forest trees. The surface on which the tea plants are growing is much indented, and excavated; for being loose, it is easily encroached upon, by accumulations of water when they take place in the channels. Thus situated on a loose and defenceless bank at the verge of a forest, this colony of tea plants may be considered as undergoing gradual obliteration from destruction of the surface, and there is reason to suppose that it has at one time been much more extensive than it is at present.

Gubru-Purbut.—The fourth colony of tea plants we visited, is three days' journey E.S.E. of Joorhath, where the plant is found in a bright yellow, or red soil, on the lower extremity of a small range of gradually declining hills, extended about three miles from the Naga Mountains into the valley. The extent of ground which is covered by this group of plants, is about 60 yards in diameter, and of circular shape. The spot is raised about fifty feet above the plain, which is low, marshy, and covered with reeds on the northern and eastern side; but the low ground on the S.W., where a small valley is formed between the hill and the mountains, is cultivated with rice, and contains several villages; but at the immediate foot of the eminence on which the tea plants are situated, the ground is too low and subject to inundation, to admit of any sort of cultivation, so that this locality of the plant may be said to be surrounded by inundated grounds on all sides except on the S. E., where the narrow chain of hills covered with forest, connects it with the Naga mountains.

* Water courses, or what are called Beels, are common features in this part of the country, and are formed by the inundations of the Bramaputra, which, retiring rapidly, have excavated shallow channels in the alluvium to the depth of three or four feet, where the superficial yellow clay interrupts their farther progress. When not too low, they form good rice groundr and pasture.

Tingrai.—Tingrai is the fourth colony of tea plants we visited in Assam (though I have here placed it fifth and last).

The boundary of this colony, like that of the lower one, is abrupt and defined at that portion which is presented to the direction of the current; while the lower extremity presents a lingering train of straggling individuals extended along the direction of the stream, thus proving the migration of the plant in the course of the currents, from the upper to the lower colony.

Suspecting from these interesting facts, that both colonies were supplied from some more permanent and extensive location of tea plants, I pursued the extreme channel in the direction of its source; and in doing so, found that several smaller channels entered it from the S. E., indicating a gentle ascent of the surface in this direction, from whence probably the tea seeds were directed forward from some original depôt, to the places just examined.* Having proceeded about a mile into the interior of the forest, I found my attendants who were boatmen, and not much accustomed to expose themselves, where the foot prints of tigers were so numerous, had thought it most prudent to return, and on finding myself alone, I followed their example without accomplishing the object in view.

Chemical Examination of the Assam Tea Soils.—Soil from the roots of the tea plant at Cuju. Colour light grey, uniformly fine dusty sand, without consistency. Rubbed between the fingers it feels rough, is without smell; surface broken, undulating, excavated, dry and loose, uncovered with grasses, and apparently arid.

Constituent parts in 200.

Water,	37
Fresh fibres,	1
Vegetable matter,	$5\frac{1}{2}$
Silex,	135
Alumina,	11
Oxide of iron,	$4\frac{3}{4}$
	$194\frac{1}{4}$

Soil of the neighbourhood, taken about 500 yards beyond the boundary at which the tea plants disappear. Colour, greyish black;

* The discovery of an additional colony of tea plants in this vicinity since it was visited by the deputation rather strengthens this view.

surface, covered with grasses, moist, uniform, firm and solid. When rubbed between the fingers this soil possesses considerable coherency and softness.

Constituent parts in 200.

Water, ...	52
Extractive matter, ...	5
Vegetable matter, ...	$8\frac{1}{2}$
Silex, ...	114
Alumina, ...	$9\frac{1}{2}$
Oxide of iron, ...	4
	193

From the foregoing enquiries it appears that the tea plant of Assam grows spontaneously under slightly distinct circumstances as follows :

1. In the level plain.

2. On embankments or mounds somewhat raised above the plain. Cuju, Noadwar and Tingrại are examples of the first, Nigroo and Gubru-purbut are examples of the second.

The first class of situations, are distinguished from the general plain by a porous structure, and the peculiar character of maintaining a dry surface under exposure to excessive moisture ; the second by a structure less porous than the first. In both, the plants are situated at the verge of inundations which prevail during the greater portion of the year on the adjoining lands.

The important peculiarity of these sites is, that they are less secure from inundation by their elevation than by their structure. Indeed the lower sites are scarcely raised more than a yard above the adjoining flat plains, which are exposed to inundations not merely during falls of rain, but also from the overflowings of the great rivers. But these circumstances, which are sources of fertility to the adjoining lands, appear to produce an opposite effect on the sites of the tea plant, thus causing the peculiar condition on which the presence of the plant in some measure depends. All soluble and subtile matters are prevented from accumulating in the soil of those sites, and are washed as it were from a filter into a loose sandy bottom—all vegetable and animal decompositions, and all chemical operations except the oxidation of particles of iron, are here prevented from taking place. Hence the characteristic colour of the generality of these soils already pointed out. Protected in Assam under the shade of dense forests and a gloomy and excessively humid atmosphere (the latter the most indis-

pensable of all conditions as I shall presently show), the tea plant flourishes in its barren soil along the verge of rivers, lakes, and marshy lands.

Where the requisite porosity of structure is not afforded by subsoils, the defect may be overcome on the rounded summits of embankments, and on the declivities of small hills and undulations, such as those on which the plant appears to be cultivated in China :* and where these last are wanting artificial drains and trenches may be resorted to, either with the view of qualifying an unfavourable soil for the reception of the plant in the first instance, or for supplying the want of suitable porosity.

In the more sandy rice districts, the small ridges which subdivide the fields may be increased in size, and each planted with a single row of tea plants, a practice which would seem to be followed in China although the erroneous notions hitherto entertained regarding the supposed mountain habit of the plant, prevented the example from having been before recommended.

There are however many spots of suitable structure in Upper Assam, that might be selected for new plantations ; the most desirable might be at once chosen, while the old colonies should be carefully preserved for the supply of nurseries. This would seem to be the more necessary, as in case of the seed becoming exhausted by the injudicious treatment of the plants composing the original colonies, the difficulty that might arise in procuring a fresh stock from China might prove fatal to Assam as a tea province. From those tea seeds which were procured from China at an enormous expense to Government, few plants have been reared, and probably not one of those few will ever bear seed. The importance therefore of abstaining from officious interference with the original colonies must be evident. None of them are very great in extent, and it is possible to conceive that as they are all in retired forests some attempts may be directed to the transplantation of the trees in a more convenient but less appropriate situation (as is almost sure to happen on such occasions if *convenience* be at all allowed to enter into our views), and thus exhaust, if not totally destroy the means of conducting more judicious experiments.

Little is to be expected from any attempts that can at present be made to manufacture tea from the uncultivated plant : but still as there is a small establishment on the spot for the purpose, consisting partly

* I shall have occasion to refer to authorities on this subject when considering the climate of the tea provinces.

of Chinese, they might be employed in constant trials upon the leaves afforded by the different colonies in order to detect what the nature and degree of difference may be, between the products of the different soils as well as of leaves of different size. The mode of manipulation adopted with regard to each specimen, and how diversified, should be carefully noted, and reports upon the subject forwarded to Calcutta by the person in charge ; together with specimens of the prepared tea packed in leaden boxes containing those aromatics upon which some of the finer qualities of teas may depend.

Climate.—The wind in Assam is N. E. at all seasons, and the whole valley lies in the direction of its current. Descending from the Himalaya the air derives an impetus from its low temperature, and consequent greater specific gravity than the heated westerly wind. It is not meant that the air in the upper atmosphere in contact with the snow is heavier than the lower strata in the valley, which would be contrary to certain well known laws ; but merely that the air in the vicinity of the mountains above the line of congelation, is rendered specifically heavier than the general air of the same altitude, in consequence of the heat absorbed from it by the snow. It consequently sinks, causing a motion in the warmer air to occupy its place. Thus an upper current is formed while the lower one descends into the valley where its diminished temperature renders it sufficient to overcome the heated land winds which enter from the west, by the great defile of the Bramaputra.

During those months when the westerly winds have greatest power, and the influence of opposing currents from the N. E. extremity of the valley most diminished, in consequence of the disappearance of a larger proportion of snow in that direction ; the westerly winds then extend with lessening temperature and velocity as high as Bishenath in Middle Assam, beyond which they are seldom known to reach ; nor is their power even there sufficient to overcome the influence of the N. E. current, more than for a few days at a time during the hottest days of April and May.

Throughout the cold season, dense vapours arise from the Bramaputra about day-light, and continue to increase until 8 A. M. when they begin slowly to ascend. They are then drifted before the N. E. wind, which from the diminished heat of the valley now amounts only to a gentle movement, the direction of which is modified by the action of the sun's rays on the upper stratum of mist, causing a more or less powerful dissipation, and exciting a movement

in the general mass towards the side on which this action is taking place. The whole of the vapours are thus attracted towards the south, where unless entirely dispersed by noon, their broken masses linger on the northern face of the Naga mountains, receiving daily fresh accumulations, until they are precipitated in heavy rain, seldom however before they have served as an impenetrable canopy to this side of the valley for several weeks.

This tendency of the mists to occupy the south side of the valley, is an interesting point if considered with reference to what I have already stated regarding the absence of the tea plant on the northern side. The plains on the northern side of the Bramaputra, may indeed be considered generally to enjoy two hours more sunshine daily, during the cold season than those on the south, a circumstance which is of itself calculated to influence vegetation, and cause a difference in this respect between the two sides of the valley.

With regard to the cause of these mists, it would be easy to say that they arise from the moisture of the forests; but if this were all, they should appear after sun-set when the heat of the day is first withdrawn; the loss of temperature would then cause a condensation in the lower atmosphere, which is not the case in Assam; nor do the mists first make their appearance in the forests, but on the river, and on such parts of it as are shallowest and most languid in current.

I attended as closely as I could without neglecting other equally important matters, to these peculiar phenomena, and the only conclusion I could come to from the observation of simple facts was, that they arose from the difference of temperature between the water of the Bramaputra and the air, which amounted to a mean difference of 15° Fahr. during the month of December. Throughout that month, in our progress up the river from Gowahatti to Suddya, I found the water at sun-rise vary from 55° to 56° Fahr. and the temperature of the air at the same time, from 38° to 42° Fahr. This difference causes the water to give off more vapour than the air can hold suspended in an invisible form; partial condensation immediately ensues, and the sensible vapour is then seen curling over every portion of the river, just as steam presents itself to view ascending from the surface of heated water.

Those high altitudes by which Assam is surrounded, occasion a rapid abstraction of heat during the nights of the cold season, in which the waters and the air participate unequally, as conductors of different powers. The latter consequently retains a higher mean temperature than the former, and assists during the cold season to check excessive diurnal variations. On the other hand, in the hot season, when

the radiation of heat from extensive wastes of sand is prevented by the freshes which cover them, and the volume of water increased, as well as the rapidity of the rivers by the melting of the snow ; the rivers then present a temperature much beneath that of the atmosphere whose heat they now contribute to lessen, just as they promoted an opposite effect during the cold season. Nor is this influence of large bodies of water upon climate confined to Assam ; it applies equally to all great valleys similarly situated, and especially to those inland provinces of China whose productions are so similar.

From what I could learn regarding the temperature of the hot season, it would appear that 82° Fahr. at Suddya, is considered as excessive as 96° in Calcutta ; and although the quantity of rain that falls during the year may be supposed from a combination of circumstances, to be much in excess of what falls in Bengal, yet there is reason to suppose that during the months of July, August, and September, the quantity in Assam may be no greater than elsewhere ; the absence of any season of perfect drought being the peculiar feature of the climate. If however the theory by which I have endeavoured to account for the peculiarity of wind, during the S. W. monsoon be correct, it is difficult to conceive that clouds and showers should not be frequent, or at least occasional during the months of April and May.*

From these general observations on the climate of Assam, we may venture to infer that in regard to heat and moisture, it possesses many peculiarities when compared with the open plains of Bengal.

Looking down from the Kossia mountains into the valley, in November, it presented the appearance of one vast lake, from the sheet of vapour under which it was concealed for several hours daily.† While ascending the Bramaputra in December, the weather was generally dark and gloomy with some rain. During the time we were in the forests, which embraced the greater portion of January, we

* On two winds of different temperatures and differently saturated coming into contact, the result would be the formation of a cloud or the precipitation of rain according to the proportion of moisture contained in the warmer vapour. See Prout's *Bridgewater Treatise*, 292.

† This was sometimes observed even for several days, and may be considered to have been actually the case during the greater part of the two following months, but being then in the valley we could not perceive it otherwise than by the shade. The effects of these clouds upon vegetation, and in checking extremes of temperature, may be conceived from the circumstance that when they were first observed from the Kossia mountains, a keen N. E. wind blew daily, and from which the valley was quite protected by the vapour.

seldom saw the sun; and the early part of the month was chiefly wet. February, and until the middle of March, was generally wet; nor have I often witnessed even during the regular rainy season, heavier or much more frequent falls of rain than took place in Assam at this period. On the most moderate computation, I do not think we could reckon the quantity of rain that fell during the three months above mentioned, at less than 15 inches; yet during the same period in Calcutta, I find on reference to Prinsep's Journal, that only 2 inches of rain fell—one shower only having taken place in December, January being dry throughout, and February affording but two days on which any rain whatever fell.

I have already hinted at the importance of Zoology as calculated to assist in casting a light upon the peculiarity of climates, and as affording data for the comparison of one with another. If we consider how instrumental birds for instance are, in the dissemination of plants, how essential certain seeds and certain flowers are to the support of certain animals and insects, we perceive at once rational grounds for expecting to be able to trace an accordance between the vegetable productions of our country, compared with those of another, when the Zoology of both agree in particular features; and hence the application of these principles to the present object.

The preponderance of Malayan over the northern forms in Assam, notwithstanding the lofty range of mountains which might be supposed to contribute to an opposite effect, and rather attract animals towards the south is an interesting indication which will be at least corrected, if not confirmed by my collections. But though lofty ranges of mountains afford climates equal to certain proportions of higher latitudes, yet animals in order to enjoy such insulated positions would be confined to ridges only, without being able to indulge their natural wandering propensities except under exposure to the heat of valleys. On the other hand, animals of the south may extend considerably beyond the strict limits of their geographical sphere, by taking advantage of the shelter of mountain chains, and thus experience no very remarkable change of circumstances from what nature intended they should bear; and in this way we may account for many of the peculiarities of the natural history of Assam, which are not confined to the tea plant, but extended to other species perhaps equally restricted in their habitat. In the animal kingdom the interesting genus Ciconia of Cuvier presents two distinct species of crane as large as the adjutant (ciconia dubius) and which are quite unknown in Bengal or any other

part of India. I have already adverted to a large squirrel as peculiar to Eastern Assam, and although it is there extremely common, not an individual has been found in Lower Assam; or even beyond the northern limit of the alluvium. From thence it is probably extended to the eastward, but occurring only in valleys affording similar vegetation, and consequently possessed of similar peculiarities in structure and climate to Assam. The Simia Hylobates agilis Duvaucel a species of ape, appears from the observations of Dr. Harlan to be almost equally limited to Assam and its vicinity.*

If from the lower animals we now direct our attention to the various tribes of man which compose the several nations by which Assam is surrounded, we shall find the same line of demarcation interposed between the eastern and western varieties of this species, as already observed with reference to other beings. The Singphos, or people who inhabit the Dupha mountains display in the construction of their face, the light colour of their skin, their manners and ingenuity, the almost pure Mongolian or Chinese race. The Nagas on the contrary, who inhabit the vast mountainous country extending from Assam to the frontier of Birma, incline (if I may judge from the few individuals I had an opportunity of witnessing), to the most degenerate of Caucasian Hindoos, but without a trace of their religion. Yet it is a curious fact' that the Kossia tribe which occupies the western extremity of the same mountain-group, are a well marked branch of the Mongolian race, which here appears to have extended to the extreme point where the climate and natural productions cease to resemble those of the countries from whence they were derived; and thus surrounded by powerful Caucasian nations, and intercepted by the Nagas, this insulated people appear not merely to have maintained their independence; but the purity of their blood, as well as distinct customs, language, and religion.

In this way we derive from Zoology additional aid in support of those views which the sister sciences afford, and are taught to look upon the tea plant in Assam, thus associated with the natural productions of Eastern Asia, not as an alien estranged from its own climate, but as an indigenous plant neglected it is true by man, but in the full enjoyment from nature of all those peculiar conditions on which its properties will be found under proper management to depend.

* It is described in his Medical and Physical Researches, Philadelphia, 1835, page 10, as a new species under the name of Simia hoolock.

5.—*Notes on the Agriculture and Rural Economy of the Valley of Nepaul.—By* A. Campbell, *Esq. Officiating Assistant to the Resident.*

[Dr. Campbell has obligingly favored us with a copy of his excellent treatise, under the above title, which forms the 2d fasciculus of the 4th vol. of the *Trans. of the A. and H. Society*, of which we avail ourselves to introduce the general descriptive portion in this Journal. —Ed.]

The entire surface of the valley of Nepaul is either under regular cultivation, or capable of being so. It is completely free from rocky and stony tracts, as well as sandy wastes; and, with very few exceptions, the fields have a superficial stratum of nutritious soil, a foot or more in thickness. The area of the valley, in the absence of a professional survey, cannot be correctly stated; nor is it easy to make a near approximation to it, on account of the irregular outline formed by the basis of the boundary mountains, which throw spurs inwards in some places more than a mile in length, forming bays or subordinate valleys of considerable extent. The average extreme length from east to west, including the retiring valleys, may be estimated at 20 miles, with an equal breadth, similarly calculated. The valley proper, or such an area as might be squared by drawing a line along the inner extremities of the mountain spurs, has a diameter in either direction of about 15 miles. Within this space however, is included the low ridge of hills which being given off at Dochoke, the western mountain boundary of the valley, runs eastward and by south, crossing the channel of the Bagmutti river, until it terminates in the general level near the village of Sussanally, situated at the south-east corner of the valley. The above limits give as a maximum average of arable surface 400 square miles, or 3,56,000 English acres, and as a minimum average, 222 square miles, or 1,42,000 acres. The former, on account of the hilly portions which intervene in the subordinate valleys, and are but partially cultivated, is considerably I believe beyond the mark, while the latter estimate, from excluding altogether the retiring valleys, is to that extent deficient, as the surface of these subordinate valleys, is of greater extent than the uncultivated proportion of the mountainous spurs which form them. We may I think safely assume as a mean, and correct diameter to the arable land, 18 miles in each direction, which gives an area of 324 square miles, or 2,07,360 English acres asunder, or fit for agricultural operation, and for yielding the higher descriptions of produce. There are precipitous portions of the mountainous faces bounding the valley, particularly on the south and

west, where Indian corn and Murwa are occasionally cultivated; but the angle of these is so acute and the soil so unproductive as to render the husbandry of the rudest possible description and their produce too scanty to entitle them to be included in the regularly cultivated valley land. To speak generally, the mountain bases bounding the valley, too steep to admit of being cut into terraces, are excluded from the area above laid down; and with sufficient reason, as, in such lands, water cannot be retained for the growth of rice, and the quality of the soil is such as not to admit of the sowing of wheat, or any of the numerous and nutritious pulses, which abound in the more level lands. The crops of such places are limited to Indian corn, Murwa, and Phofur.

The general appearance of the valley, viewed from the summit of any of the surrounding mountains, is that of a series of hills with intervening valleys, irrigated plentifully by miniature canals, and traversed in a waving line from north-east to south-west by a moderately sized river, in which many of the streamlets directly terminate, and in the direction of which all are bending their course. This appearance is not so striking in the drier months of the year, although sufficiently evident even then, as during the rainy season, when the Bagmutti river by which the entire waters of the valley quit its boundaries, may be most aptly likened to a large venous trunk of an animal body, formed by innumerable smaller branches, each collecting at their source the fluid which animates as it runs, the bodies which surround it. From the cloud capped mountain peaks these little feeders take their rise, increasing as they rush down the precipitous sides, until, arrived at the more level base, they grow calmer and less fretful, permitting themselves to be diverted by innumerable chann els into the fields below, and their speed to be wasted by diffusion over the terraced flats prepared for their welcome reception. Others of these feeders issue in considerable volume, and at once, from the foot of the hills; forming abundant and permanent springs of the clearest water. This occurs especially at the foot of Nagarjun, a high round-shaped hill forming the western boundary of the valley, covered by a thick stratum of soil from base to summit, and having in the neighbourhood of the spring no water course for the torrents along its face. At Nilkanth on the northern, and at Godawrey on the southern boundary, there are similar springs which continue to pour forth a steady stream throughout the year. Each of the springs is the favourite resting places of the respective presiding deities, whose images alone are now extant; but according to popular belief these

holy emblems are of divine origin, not having been made by human hands.

Viewing the valley from its centre, and contrasting its surface with the masses of mountain which surround it, it has the appearance of a plain gradually rising on all sides to the bases of the mountains, but a more careful examination points out a division of its surface into two separate elevations. These I shall call the *higher* and *lower levels* of the valley when describing the agricultural occupations of different seasons, as the general system and routine of husbandry varies on each. In the above division of the valley's surface, the hill sides under rough cultivation are not included. The lower level through which the two principal rivers (Bishomutti and Bagmutti) and their feeders run, is for the most part, nearly flat, having a very gradual descent from either side of the valley towards the main streams. Its soil is less clayey in general than that of the upper level, and from the greater facility of irrigation and certainty of flooding during the rains, its crops of rice are more productive, and its value for purchase and rent higher. The upper level, has for the most part, an elevation of from 30 to 80 feet above the lower. In some places the one gradually runs into the other, the transition being unaccompanied by any sudden or defined line, terraces of cultivation extending from the top of the upper level, down to the river edges. In other places the one is defined by perpendicular descents of 50 or more feet, along the basis of which the rivers sometimes have their course, while in a third place these precipitous banks point out the different levels far removed from the streams. The extreme height of the upper level is no where more than 100 feet above the lower; for the hill of Simbhunath although, at first sight belonging to this division, is really a spur from the neighbouring hill of Ek Changu. The hill near the temple of Pusputnath is elevated more than 100 feet above the Bagmutti, as this stream winds its course round three sides of it; but this hill may also with propriety be excluded from the valley levels and looked upon as a portion of a low range of hills stretching from north to south, and crossing the course of the Bagmutti. The Gankurun hill, which is a spur from Sheopooree, forms the northerly extremity of this partially defined range; on the south it vanishes gradually into the ordinary higher level of the valley lands.

To recapitulate summarily, we have in the valley of Nepaul, an area of 325 square miles of arable land, forming a basin of uneven surface surrounded by a circular chain of mountains, varying in height from 500 to 2,000 feet above the plain, watered

by innumerable streams, and blessed with a healthy climate and a fruitful soil. The capital of Nepaul is placed by Buchanan in north latitude 27° 42', and east longitude 85° 36', the mean elevation of the valley is reckoned at 4,782 feet above the plains of Bengal, and the heights of its surrounding mountains by barometrical measurement are as follows.* Mahadeo Poker, or the highest peak of the eastern boundary, 6,786 feet; Jaber Powah, the north-east boundary, 5,716; Sheopooree, or the highest peak of the northern boundary, not known; Colonel Powah, on the nort-west corner, 6,654; Chandragiree, or the southern boundary, 6,600; and Phoolchoke, bounding the south-east corner, 6,800. These circumstances exercise such a powerful influence over the produce of the soil, as regulators of climate, that they will not, I presume, be deemed out of place as prefatory observations. The mean annual temperature of the valley is 64 . The population of this area was estimated by Mr. Hodgson, in 1832, at no less than 2,90,000 souls, which allowing 400 square miles as its inhabited extent, gives the extraordinarily large number of 725 to the square mile: a proportion so far as I am aware, not known to exist in any country of the world, and one which I believe Mr. Hodgson is willing to allow to have been rather exaggerated even for the valley of Nepaul. It is however certain that this valley teems with human beings, its whole surface being sprinkled with towns, villages, and insulated dwellings. No portion of India with which I am acquainted can be compared to the valley of Nepaul in density of population, and it is not improbable that after the most correct estimate shall have been obtained, it will shew a population, compared with its area, equal in extent to that of any country in civilized Europe. Allowing the utmost possible extent of area to the valley within its mountainous boundaries, we could not assume more than 30 miles in length, and as much in breadth,† as its dimensions, or 900 square miles; and at this exaggerated rate, we should still have, by Mr. Hodgson's estimate, a population of 322 and a fraction to the square mile. In East Flanders, as containing the maximum rate of all Europe, a recent census gives 560 souls to the square mile. In the most populous parts of Ireland the greatest proportion to the square mile is 345 souls. In Berkshire in 1831 it was only 193 to the

* Captain Robinson is the author of the observations which give these measurements.

† These are the limits assumed by me taking in the sub-valleys around the big one.—B. H. H.

square mile. In Bengal it is estimated at 203 to the square mile,* and in the cultivated portion of Orissa it did not exceed, when Mr. Stirling's report was compiled, 135 to the square mile. The population, whatever be its real amount, is almost entirely agricultural, as, with the exception of the soldiery stationed at Cathmandu, amounting to 6 or 7,000 men, and the chiefs and higher officers of Government every inhabitant is more or less directly engaged in the culture of the soil. The artizans, religious orders, and persons employed in the government offices do not, it is true, actually labour in the field, but being almost universally the representatives of the Irish middlemen, and Scottish tacksmen, they come correctly under the denomination of Agriculturists. The poorer artizans, such as carpenters and bricklayers, divide their time between the practice of their trades and the culture of their little fields, while the better class of tradesmen, although enabled to confine the work of their own hands to their crafts, are invariably holders of land, sometimes cultivating it by means of hired labourers, but most commonly by the system of subletting to the Japoos, or the strictly speaking agricultural class of the Newars. The arrangement usually made by these land holders is for the receipt of one half the produce, the actual cultivator retaining the other, as his wages of his labour.

Formation of the valley soil.—The soil of the valley, although considerably diversified, is in the mass composed of alluvial deposite, there being no traces on the general surface either of the primary or secondary rocky formations; indeed, throughout the entire extent of both levels, there is not a stone of any magnitude, and scarce a pebble to be found. The only rocks accessible within the valley, are those composing the diminutive ranges described as spurs from the surrounding mountains, and trans-secting the basin. These are of several kinds, some of them, as in the more easterly portion of the range which tends from the west towards Sussanally on the east, contain a considerable quantity of carbonate of lime, but so intimately blended with a clayey slate stone, as not to admit of being converted into quick lime by burning, although it will frequently effervesce on the application of muriatic acid.

* Mr. Bayley estimated the population of Burdwan in 1814 at 600 to the square mile, but this district is incomparably the most populous one in Bengal, as Lancashire is of England. In the county the population is estimated as high as 800 to the square mile, a difference from that of Berkshire greater than between Burdwan and Bengal generally.

To the west of the Sumbhunath hill again where there is a stone quarry, the rock is either of grey granite, or of a crumbling sort of sand-stone tinged with a reddish yellow colour. The Gankurun hill is composed, at its northern extremity, of hard granite with a superficial stratum of clayey slate, which is under constant decay, leaving a reddish clay soil along the sides. The granitic portion is exposed to the extent of 20 or 30 yards in the bed of the Bagmutti as it passes through a cleft on the northern extremity of the hill, the stratum forming an obtuse angle (say of 20 degrees) with the horizon. Of whatever variety, the superficial soil must, I think, be regarded as a debris formed during ages of decay from the surrounding mountains; for although the composition of the soils occupying the central parts of the basin may not be easily traceable at the present day to their mountain progeners, the similarity in many places of the soil along the mountain bases, and stretching for many hundred yards beyond them into the valley to the earthy or rocky formation of the hills immediately over them is distinctly manifest. An example or two of this may be recorded; the southern aspect of the Sheopooree boundary, is formed, to an elevation of about 800 or 1,000 feet from the mountain's base, of a white micaceous sand-stone, and we find the superficial stratum of soil which extends into the valley, on the higher level, for about a mile, of a very light sandy nature, largely mixed with mica. The superficial stratum of the valley face of the Nagarjun mountain is principally composed of a stiff and hard red clay, to which we find corresponding in the whole of the cultivated land lying along its base from the Sumbhunath hill to Ballajee, a distance of three miles, a great predominance of this substance.

The process of addition to the valley land from the mountain debris is in some places at this time in such active operation, as to be distinctly observable in annual additions to the cultivated spots extending up the declivities of the mountains. On the valley aspect of Chandragiree which forms the south west boundary, this process is very obvious. The valley by traditional lore is described as having been an immense lake, the Sumbhunath and Pusputnath hills forming lands on which the gods found resting places and appropriate sites on which to be worshipped. The drawing off the waters is of course ascribed to the direct agency of some of the local deities, and "*the Sabre* cut," though the southern boundary of the valley forming the only outlet for the present waters, and the one by which the lake was emptied, is still pointed out as the handy work of a renowned demi-god (Manja Ghosa by name). An earthquake, with which the people of the Himalayas

are sufficiently familiar now-a-days, as they doubtless were in remoter times, is an agency they will not accept of as more likely to have burst asunder the rocky barriers of the lake and given exit to its waters. HUMBOLDT or JACQUEMONT could probably have solved this interesting question. It is remarkable that in no part of the valley are fossil shells of aquatic races to be found, a circumstance sufficiently curious when taken in combination with the opinion of the former state of the country. Dr. BUCHANAN seems to have assented to the popular notion on the subject, without offering an explanation of his views. It is however certain, that if the narrow passage through which the river now flows did not at any previous time exist, the tract above it, which includes the whole valley, must have been a large lake, formed by the pent up waters of the surrounding hills, which now form the Bishomutti and Bagmutti river, with the innumerable tributary streams. Not a drop of water finds exit from the valley, save by this one narrow outlet, which pours its torrents in a southerly direction through the Mahabharat and lower ranges of hills, into the plains joining the Ganges near Monghyr. The waters from the outer side of the northern, eastern, and western mountainous boundary of the valley, run east and west, the ormer falling into the Koosi, the latter into the Tirsoolgunga of the hills or Gunduck of the plains. The Koosis (for there are several streams bearing this name within the hills east of Cathmandu), unite their waters in the plains, and fall into the Ganges opposite Bhaugulpoor. The Tirsoolgunga reaching the plains at Tirbeni, flows through Sarun to the Ganges, joining the latter river at Hajeepoor.

Winds, Rain, Pressure of the Atmosphere and Temperature.— Not being at present prepared to give a specific account of the climate of the valley from personal meteorological observations, it will be sufficient to indicate generally its character as it has reference to the productions of the soil.

The most marked characteristics of the valley climate, are its extreme humidity and the irregularity of the winds, as to direction and intensity. The former of these circumstances, arises from the retention of so much water as is required for raising rice crops, together with an annual average fall of 50 inches of rain water ; and the latter, from the high mountainous boundary girding the valley, by which the currents of air passing over their summits are prevented from reaching the valley's surface. It is often difficult to ascertain correctly from what direction the

wind blows, so calm is the atmosphere, or so irregularly do blasts from the mountains rush down into the subjacent plain. This calmness and irregularity in direction of the winds is most marked during the rains, and early part of the cold season, or from the middle of June to the end of January. From the beginning of February to the commencement of the rains, the wind blows during the day pretty steadily from the west, veering round to the north-west at evening during the months of February, March, and April, and to the south-west at the same time of the day during the month of May and early part of June. From the commencement of the rains until their termination, the wind blows *generally* from the south, and south-west; *occasionally* from the east, and south-east, and very rarely indeed from the west or north-west. After the cessation of the rains, which is generally simultaneous with that season in Behar, the winds are more various, blowing occasionally from all quarters, but *most rarely* from the west, and *most frequently* from the north. A register of the direction of the wind kept at any one part of the valley would but ill suffice to ascertain accurately the course of the wind for the day throughout the valley generally. It is almost always observable at the confines of the valley that the wind blows from the mountains at evening, and although I cannot state the fact from observations made at the same hour in different parts of the valley confines, I have, when in these situations, so invariably observed the wind to blow from the nearest mountain, that I believe at evening during the dry and hot season especially, the wind blows from all points of the horizon into the valley at the mountain bases; after which the currents of air are joined with the wind prevailing in the valley proper, with which they are carried along in its direction. The breezes which come rushing from the mountain sides after and about sunset, ought not perhaps to be noted in ascertaining the directions of the wind in this valley as they are doubtless no more than currents of denser air, descending to take the place of more rarified volumes of atmosphere, but as these winds sometimes extend for a mile or two from the mountains, they are apt to mislead, as to the direction of the actually prevailing wind in the valley generally. Spurs from the mountains, which form bays or subordinate valleys protect these spaces from the influence of the prevailing current of air to the distances above noted. The average annual temperature of the air in the valley approximates that of the climates of the southern European countries: a circumstance which will explain the ready growth of the peach and pomegranate, wild and in the open air. The greater moisture of this climate than of those of

southern Europe, explains the wonderful fertility of its soil in raising rice crops.* The following abstract of recorded observations, although insufficient for the purpose of settling with precision the mean temperature and pressure of the atmosphere of the valley gives an indication of it which may be usefully referred to, in comparing the course of the season, and the round of agricultural employments here, with those of India and Europe.

The mean height of the mercury in the barometer during the month of January, 1837, calculated from daily observations at 10 A. M. and 4 P. M. and reduced to the 32d degree of Fahrenheit's thermometer was 25.448 inches. The mean of similarly made odservations for the month of June, 1836, was 25.154. Taking these months respectively as those during which the mercury stands higher and lower than any others of the year, we have as the mean altitude of the mercurial column for the year, 25 inches, 301 thousandths or 3-10ths.

It is remarkable, that the months which shew the greatest elevation and depression of the barometer, should also exhibit *inversely* the highest and lowest degree of temperature throughout the year. The mean temperature of the air during the day outside and in the shade, for the month of June, 1836, calculated from observations taken at 10 A. M. and 4 P. M. was 78° of Fahrenheit's scale.

The mean of observations similarly made in January, 1837, was 47° of Fahrenheit's scale. The temperature of these two months, which exhibits the extreme of heat and cold during the year, gives as the mean annual temperature of *the day* at Cathmandu 62° of Fahrenheit's.† It is unnecessary to keep in mind here, that as no *night observations* have been quoted, the mean temperature of the 24 hours of these two months cannot be correctly stated, and further, that as the temperature of the day is at its maximum here, at 4 P. M. at which hour observations made have been quoted, the mean temperature of the day and night together, must be considerably below 62 degrees. The mean minimum temperature of January, 1837, calculated from observations taken by me from a self-registering thermometer, exposed to the air in a western verandah, was 32 degrees of Fahrenheit's scale. The mean maximum of observations taken by Captain ROBINSON at 4 P. M. for June, 1836, is, I find, 81°. If it is

* The mean annual fall of rain north of the Alps is rated by MALTE BRUN at 25 inches. The fall south of the Alps at 25 inches. In this valley it was 50 inches in A. D. 1835.

† The observations for June, 1836, above quoted are by Captain ROBINSON; those for January, 1837, by myself, but with the same instruments kindly lent by Mr. HODGSON.

allowable to calculate the mean temperature of the year from the mean maximum of the day, during the hottest month, and from the mean minimum of the night, during the coldest month, we shall have 55° 3′ of Fahrenheit's scale as the mean annual temperature at this place. It is necessary to state, that this latter mode of striking the mean annual temperature is only given as subordinate to the first mode, as the mean minimæ taken by me, and the mean maxima by Capt. ROBINSON were from different instruments. The result is nevertheless of some interest pending the collection of a more full and correct body of meteorological facts. The mean annual temperatures of the air in some of the southern European countries as recorded by MALTE BRUN, affords a ready means of comparison between the climate of this valley, and the climates of those favoured countries. At Palermo, the mean annual temperature is rated at 62 degrees of Fahrenheit. The mean annual temperature of Lisbon is 60 degrees ; that of Rome 59 degrees of Fahrenheit, and that of Paris 50°. The mean of these four climates gives a temperature of 55° $\frac{4}{5}$ which is the mean annual temperature (according to the more recent authorities than MALTE BRUN), of Montpellier, the climate of which is unrivalled in Europe or out of it for salubrity to the human species.* The mean annual average of the day at Cathmandu, has been rated above at 62°. of Fahrenheit, and the mean annual temperature of the day and night at 55° 3′. By the first mode of calculating the average, we have at this place a mean annual temperature for *the day* exactly similar to the mean annual temperature of Palermo, while by the latter method, we have for the day and night a mean annual temperature corresponding to that of the sanatarium of all Europe, Montpellier, It is probable, that a temperature between the two, may be found to give the most correct estimate of the mean annual temperature of this valley, say 58° of Fahrenheit, which correspond with the estimate now before me of the climate of Montpellier by MALTE BRUN. The following tabular view will render the comparison of these climates more easy.† Fractional parts of a degree not being of much moment in quoting the indication of temperature by Fahrenheit's scale, are omitted.

* For a notice of the climate of Montpellier, see a paper by Dr. ROYLE in the Asiatic Society's Journal, which is not at present within my reach. MALTE BRUN rates the mean annual temperature of Montpellier as nearly the same as at Rome, viz. 59°, but Dr. ROYLE from more recent authorities states it at 55°.

† Whether I am correct or not in stating the annual mean temperature of Montpellier at 55°; does not materially signify, as the recorded statement of MALTE BRUN making it under 59° brings its estimate so far as temperature is concerned, wonderfully near that of this valley.

Table of Mean Annual Temperature by Fahrenheit's Thermometer.

	Valley of Nepaul during the day.	Valley of Nepaul for the day and night.	Palermo.	Lisbon.	Rome.	Paris.	Montpellier.	
							By Malte-Brun.	By more recent authority.
Mean annual temperature.	62°	58°	62°	60°	59°	50°	57°	55°

Course of the Seasons, with some of their more prominent distinguishing features.

The general characters of the seasons in this valley are, from its geographical situation, a good deal influenced by those of the neighbouring plains, but its elevation above them and its mountainous confines modify here the truly tropical character of the Tirhoot and Behar seasons to a close affinity with the seasons of the temperate zone. Cathmandu is situated in the 28th degree of N. latitude, and has an elevation of about 4,800 feet above the sea; but as it is admitted by competent authority,* that 600 feet of elevation is equivalent to one degree of latitude, in affecting the temperature of the air and climate of a country, it is necessary in fixing the latitude, to estimate it at 36 degrees, as the parallel line, on other parts of the earth, with the climates of which that of Cathmandu should correspond. A comparison with those of Malte Brun's "European Sections of Climates," which occupy the line of lat. 36, corroborates this doctrine in so far as the average temperature is concerned, and also in some respects as regards vegetation.

Section 15 in lat. 35.43, includes the peninsulas and islands of Greece, as well as Crete and much of the Mediterranean. Section 16 in lat. 36.44½ includes "the state of Genoa, Tuscany, the states of the Pope, Naples, Malta and Corsica." Section 17 in lat. 36.43$\frac{1}{12}$ includes Spain and Portugal. In the first of these we have Palermo,† averag-

* Decandolle, and so far as memory serves me, by Humboldt.

† Palermo is in lat. 38°, although included in one of these sections of European Climates,

ing 62° as the annual temperature. In the second, Rome, averaging 59°, and in the third, Lisbon, with a mean annual temperature of 60°. These temperatures correspond remarkably with ours, as do in some respects the vegetable productions of these countries. In the South of Italy, rice, oranges and myrtles abound. In the Mediterranean climate, "the scarlet flowers of the pomegranate, the elegant myrtle, and the fragrant exhalations of oranges obscured under a dark green foliage, convince the stranger that he is in the garden of Europe.* In the valley of Nepaul, the wild apricot, peach, pomegranate, and raspberry, the cultivated orange, fig, citron, quince and apple, and the finest odoured roses, myrtles, lilies, and carnations may well persuade the Anglo-Indian that he is not far from the garden of Asia.

The year here with reference to vegetation may be correctly enough divided into five seasons, of which two are the most prominently marked, viz. the winter and rainy season; the former by the complete repose of vegetation and nature, as manifested by the russet hue of the grass, and the bare brown earth of the cultivated land; the latter by the excessive luxuriance and vigour of the vegetable world. Coming between the winter and rains, we have a pleasant spring, and a short summer, and between the cessation of the rains and winter, a bright and brilliant autumn. In a climate free from sudden vicissitudes of temperature during the day, as well as on the change of seasons, and remarkable for its equability, and temperate character, it is not easy to define the separate seasons by dated limits. But the following partitions of the year, have each their distinguishing marks in the vegetable kingdom, as well as to the animal senses. The winter commencing about the 15th November, and continuing till the 1st of March, is marked by heavy morning fogs, an average temperature in the house of about 48°, frequent hoarfrost at night, brownness and death of the grass fields, and the total absence of green (save towards its termination when the wheat gets up), from the arable land. The spring is ushered in on the early days of March, by occasional evening storms from the N. W., followed by showers of rain, or hail, a delightful breeze from the west, which is welcomed into every house by open doors, springs up at noon and blows till sunset. Quiet vernal showers are frequent; willow trees, apple trees and Indian lilacs, put forth their leaves and blossoms; the grass begins to sprout; the wheat fields are clothed in verdant hues; the birds begin to pair and sing, and nature throughout all her works is busy in reanimating her children, which for a while, were permitted to rest from their labours. Summer sets

* Malte Brun's Geography, vol. iii. p. 53.

in with the month of May; storms from the N. W. with westerly breezes continue, and occasional showers give a refreshing coolness to the air, now sometimes heated to 80 degrees. The cultivator is employed in sowing rice, and reaping wheat, this short season combining the climate and labours of an English summer and autumn with the cultivator's operations during October and November, in the plains of India. The rains are ushered in as in Bengal by thunder and lightning, and usually commence at the same time as in Tirhoot and Sarun. With the first fall the transplanting of the great rice crop begins, and with their cessation the harvest of the spring sown, or upland rice. The rain falls frequently in torrents as in tropical countries, but often quietly and for days together, the sky being generally cloudy: vegetation of all kinds is now in its utmost vigour, the crops grow with an astonishing rapidity, and the grass requires incessant cropping or eating by cattle to keep it down. Early in September there is a considerable diminution of the temperature of the air; thunder and lightning again commence. The rain falls more suddenly, and at longer intervals; the sky becomes clearer, and less cloudy, and by the 15th of the month, a new season has fairly set in. This season (the autumn), is marked by the pleasant and congenial mildness of the temperature to the feelings. A bright day is preceded by morning fogs and succeeded by skies as clear, and mellow as those of Italy. The face of the country is now a variegated map of green and golden yellow, with every intermediate and bright tint from growing, ripening and ripe crops; with the month of September the upland rice harvest commences, nor does the harvest throughout the valley meet with interruption until the end of November.

The seasons as above slightly sketched are five. The winter commencing 15th November; the spring commencing 1st March; the summer, 1st May; the rainy season, 15th June, and the autumn, 15th September. The winter lasts $3\frac{1}{2}$ months; the spring, 2; the summer, $1\frac{1}{2}$; the rains, 3, and the autumn 2 months.

Concluding Remarks.—It occurs to me on coming so near the termination of these notes, that three subjects of much interest have been overlooked, and that however small the amount of information in my memoranda concerning them, it may still be worth transcribing. The first of these, viz. the diseases, or destructive agencies to which crops are subject here, will not occupy many lines.

The cultivators are familiar with what I have frequently observed here, and with what our English wheat crops are often injured by. The

common term for the blackening of wheat ears is *smut*, regarded by the vulgar in Europe as well as here, as a disease. But a correct and rational explanation has been furnished by the Entomologists.* The insect known in England, whose destructive operations on wheat are precisely analogous to what is observed here, is a small orange coloured midge (Cradamya tritica), which deposits its eggs in the floret of the wheat, towards the end of June and throughout July.† The consequence of this is, that the anthers of the florets on which the larva feed when produced from the egg, are totally destroyed, and no seed is formed in the ear, which becomes black and powdered. This disease is not very general in Nepaul, but I have annually observed it to exist in the wheat crops, and although I have not seen the insect alluded to, I have no doubt that it is the cause of this effect. The wheat flowers in April, after which the smut appears. The depositing of its eggs in June and July in England, will not invalidate the idea of its being the same animal which lays its eggs here in April, as nature adapts the breeding seasons of all animals to the occurrence of the necessary favourable circumstances. The Newars attribute the smut to the state of the wind, or of the atmosphere, in general ungenial to the young wheat ear; but are disposed to believe that there is more of it in wet, than in dry spring seasons. Wheat alone of all the white crops is subject to smut. The next disease of crops prevalent here is, languishing and whitening of the young rice plants, when only a few inches above ground; this is attributed to the attacks of a large grub, called kiongki or root worm, of a black or blue colour, generally the thickness of the four finger, sometimes as thick as the thumb, and about two inches long. It is supposed by the natives to be produced, and to thrive best in rotten manure, and to devour the seed and young radicals of the plant. The kiongki is most destructive to the gohya or upland rice, attacking it soon after being sown, and continuing its ravages until about the middle of May, after which it ceases. The people do not know of what flying insect this grub is the larva, nor have they any remedy against its attacks except removing it from the fields when they see it. The third disease of white crops is a premature whitening of the ears of rice (both kinds), and the failure of the grain in them. This is attributed by the Newars to the attacks of a small grub the size of the common white maggot, the body of which is white, the head black and hard; it is called the *sheo-ki*, the marrow or pith worm.‡ The sheoki

* Messrs. Kirby and Masham.

† See Natural History of Insects in Lardner's Cyclopædia.

‡ Ki in Newari is the generic term for worm or grub. Kiong is root, and sheo the marrow or brain of animals, and pith of trees and vegetables.

is supposed to eat the roots of the rice plants, but its prey more especially is said to be the stalk and juices of the plant; for obtaining the latter of which it cuts the plants at the joints, after which the ear whitens without filling. The natives attribute the drying up of the ear and plant, to the drinking of its milk (sap), by the grub, which prevents the due formation of a full sized grain. The visitation of locust flights is the only remaining evil to be contended with by the cultivators from the insect world. There have been three annual but trivial visitations of these destructive animals within the last five years. They arrived on these occasions in May, and remained four or five days each time. Whence they came or whither they went, could not be ascertained. The natives here say they come from the plains and from the west. The Newars indemnify their losses by the locusts by collecting them in large quantities and eating them. They remove the wings and either fry or make curry of them, and consider them very good. I have seen them dressed, and tasted the dish, but cannot praise its taste or flavour. The fruit trees of the valley gardens, are the prey of a most formidable and destructive species of grub. It is about an inch and a half long, sometimes bluish coloured, sometimes yellow; it makes its attacks on the roots as well as the stems of the apple, pear, plum, and apricot trees, drilling a hole like a gimlet right into their substance, where apparently revelling on their sap, and completes their ruin as fruit bearers, and often destroys their lives. When this animal makes its entrance into the stem from without and above ground, it leaves a round hole fit to receive a common pea, and sends out behind it small grains the colour of the tree wood, which on handling crumble into the finest powder.

The appearance of these grains and their dry sapless structure induce the belief that they have been passed from the animal per anum.* The

* This grub is an inch and 1-8th long, 1-6th inch in diameter at the head, some thing in vent, as its head is the largest part and the body tapers to the tail. The head is a brownish red colour, and is formed of a very hard shell-like substance, on the anterior aspect of which there are a few delicate white hairs. The upper part of the mouth as well as both sides are formed of this shelly hard substance, the lower part of it, of a white soft substance like the body of the animal. The body is formed of twelve distinct rings of an uniform yellowish white colour. Along each side of the animal close to its belly is a row of brownish coloured spots, one on each ring. The animal has altogether 8 pairs of feet, distributed as follows: 3 pair sharp pointed directed towards and attached to the three first rings from the head; 4 pair shorter, close together, pointing to the ground, and to the 6th, 7th, 8th, and 9th rings; and lastly, 1 pair similar to the last or abdominal ones, at the vent attached to the last or 12th ring. Its body when cut open, discharges a thin clear and slightly viscid fluid, sap doubtless.

moisture of the soil, and warmth of the air during the rains conduce greatly to a profusion of insect life in the valley, and at that season the air actually teems with thousands of these busy creatures, none of which, save those above enumerated, are accused of being at all injurious to the cultivated productions of the country.

The next circumstance to be glanced at is an interesting one. The people employed in the cultivation of the valley are composed of two distinct races of men, which are divided into several totally different tribes. The Newars, who form by far the greater part of the agricultural classes (perhaps in the proportion of 6 or 8 to 1), personify in features, language to a considerable extent, in religion, and in usages, the Chinese or Thibetian race. The Brahmuns and the Khas of the Parbutteah division of the population represent the other or Indian race. The Mayars, Gurungs or Murmis, who form the remaining tribes, do not so readily admit of correct classification as these races.* The two former profess Hindooism and practice its ordinances in a very convenient and easily accomplished fashion. While the last, the Murmis, profess and practice the Boodhist religion and have a language like the Newars, indubitably derived from the trans-Himalayan stocks.

The Newars cultivate almost the whole of the land on the flats of both levels; they use the digging hoe exclusively for turning up the soil and live in towns and villages of tile and brick. The brahmuns and Parbutteahs are generally, if including Mayars and Gurungs, engaged in cultivating the soil. They occupy the confines of the valley, the subordinate valley which recedes from it, and the lands fit for yielding crops along the declivities of the mountain bases. These people use the plough partially, but not generally, and live in insulated cottages built of stone, or unburnt bricks, and generally thatched, rarely tiled.

The Murmis (indifferently distinguished by this name or by that of Bhooteas) cultivate generally the hill soils facing the valley, rarely holding lands on the flooded flats, and often extending their little patches of cultivated land and their mud and stone built and grass

* The whole mass of the population is readily referred by physiognomy and language to the Northern or Mongoul race, but is divisible by language dialectically; and by palpable varieties of the same caste of formed features; these divisions are for the whole kingdom, Limbu, Lapchu, Kiranti, Kacharia, Murmi, Newar, Jaria, Gurung, Mayar, Khas. The last is a mongrel race derived from an indigenous tribe so termed and from low land emigrants, chiefly of the sacred order, who have essentially modified the Tataric attributes of the Khas. The other tribes are still in speech and aspect Northmen, and most closely affiliated.—B. H. Hodgson.

thatched cottages, to the very tops of the boundary mountains. The Murmis use the plough, but not often; their locations being generally much too steep for it. This is but a general indication of the localities of the different tribes employed in agriculture; individuals of these races and tribes, are to be met with in all parts of the valley and its confines. The Mewar however very rarely indeed leaves a village to fix himself on the mountain tops or sides, nor will the Murmi, if he can help it, live on the flat flooded parts of the valley. The brahmun's ubiquity is most conspicuous; he is to be found in the flatest parts, on the confines, and on the tops of the surrounding mountains; but as his numerous privileges, and holy character often enable him to be exempted from the exclusive drudgery of the field, his residence on the flooded flats arises generally from his desire of being near the larger towns and temples, whence he can visit the charity bestowing, and pious portions of the richer community, or exercise his vocation as a teacher of slokes or pronouncer of munters among people little able, or anxious as his rural neighbours generally are, to question his competency as an instructor and guide.

Proceedings of Societies.

Royal Asiatic Society.—Proceedings of the Committee of Agriculture and Commerce.

April 8, 1837.

A Committee was held this day at one o'clock.

Present:—The Right Hon. C. W. Williams Wynn, M. P.; Sir Charles Forbes, Bart.; Sir George Thomas Staunton, Bart.; Colonel Briggs; John Fraser, Esq.; Dr. Horsfield; Louis H. Petit, Esq.; Colonel Sykes; Captain Harkness.

On the proposition that the Right Hon. Mr. Wynn, the President of the Society, do take the Chair, Mr. Wynn suggested that Sir Charles Forbes, who had taken so lively an interest in the success of the Committee of Agriculture and Commerce, should be elected its Chairman;

but that till that gentleman arrived, he would be happy to supply his place. This suggestion was unanimously agreed to, and

It was Resolved,—That Sir Charles Forbes be requested to accede to the nomination.

On the arrival of Sir Charles Forbes, the resolution of the Committee was communicated to him; to which having kindly acceded, he was duly elected Chairman of the Committee of Agriculture and Commerce, and he took the Chair accordingly.

The Secretary read the following Minutes of the Council of the Society:

"July 16, 1836.

"Resolved,—That the Committee of Agriculture and Commerce do consist of the President, Vice-Presidents, and Members of the Council, and of the following gentlemen:—the Hon. Mountstuart Elphinstone; Major-Gen. Sir Henry Worsley, K. C. B.; Sir Whitelaw Ainslie, M. D.; Colonel John Briggs; John Crawfurd, Esq.; James Cropper, Esq.; John Fraser, Esq.; Dr. Horsfield; M. Scott Moore, Esq. M. D.; John Forbes Royle, Esq."

"February 22, 1837.

"*Rules for the Committee of Agriculture and Commerce.*

"1st. That all Members of the Council be, *ex-officio*, Members of the Committee.

"2d. That Members of the Committee not Members of the Council, shall go out at the Anniversary, and that others from the general body of the Members of the Society shall be elected in their room; or the same Members may be re-elected. The election to be by ballot.

"3d. That the Committee do from time to time report their proceedings to the Council.

"4th. That any person not a Member of the Society, desirous of furthering the objects of the Committee, may be at liberty to subscribe for the same.

"5th. That all subscriptions for such objects be kept separate from the general fund of the Society, and applied to the objects of the Committee only.

"6th. That all subscribers of one pound and upwards be entitled to copies of all printed proceedings of the Committee."

Resolved,—That the Committee are anxious to relieve the Secretary of the Society at the earliest practicable period at which their funds will permit, from this additional call on his time and exertion; but in

the mean while, they hope that Captain Harkness will have the goodness to conduct the business of the Committee.

Resolved,—That the Secretary be authorized to obtain occasional assistance, at an amount of expense not exceeding sixty pounds per annum.

A mass of Papers were submitted to the Committee, containing the Replies of the several Collectors under the Presidency of Madras, to Queries suggested by Mr. M'Culloch, on statistics, manufactures, commerce, &c., and transmitted to India by the Committee of Correspondence of the Society.

Resolved,—That these papers be conveniently arranged for reference; and that a list of the Queries, with marginal notes indicating the corresponding number of the Reply, the places from which, and the persons by whom answers have been returned, be prepared.

Resolved,—That Mr. M'Culloch be informed of the receipt of the replies to his queries from Madras; and that he have access to the same.

Read the following communications:—

1st. From Mr. Harman Visger, of Bristol, on Lichens, with specimens, &c. &c.; and expressing his conviction that the extensive regions of the East must produce, in abundance, some of the known, and many of the unknown, though probably not less valuable, Lichens available for dyeing; that a large and certain supply of good sorts would greatly stimulate the consumption, which has been much checked by the short supply and high price of the best-known Lichens used for dyeing; that, at present, he estimates the annual import at from 60,000*l* to 80,000*l*.; that he would be happy carefully to test any specimens that may be sent to him, and to report on them; and that he had sent to the Committee such specimens of Lichens as he had then been able to procure, with a list and paper of instructions, not confined merely to them, but comprising others which he would send so soon as he could procure them.

2d. From Mr. Southey, of Coleman Street, on East Indian Wool, with specimens, &c. &c.

3d. Extract of a Letter from Messrs. Forbes and Co., of Bombay; on Indian Iron.

Resolved,—That the thanks of the Committee be returned to these gentlemen for their kind attention; and that the list of Lichens and

paper of instructions drawn up by Mr. Visger, and the letter from Mr. Southey, be printed in this day's proceedings.

Resolved,—That the specimens of Lichens furnished by Mr. Visger, of the ammoniacal liquor for extracting the colour, and of the colour required, be sent to the different Presidencies of India, and to Ceylon and China, through the medium of the home and local Governments, and to the several Horticultural and Agricultural Societies already established in India; and that fifty copies of the Committee's Proceedings of this day accompany each assortment of the specimens.

Resolved,—That the subject of Mr. Southey's communication on East Indian Wool, and of the extract of a letter from Messrs. Forbes and Co., of Bombay, on East Indian Iron, be allowed to lie over until the result of the examination of the expected investments of those articles be known.

Read a letter from the Horticultural Society of London, dated the 31st ultimo, enclosing a paper of proceedings of the Meerut Horticultural Society, and the report of the Members of the Committee to whom these communications had been referred.

Resolved,—That extracts from the paper of proceedings of the Meerut Horticultural Society be published in the Committee's proceedings of this day; and that in all similar cases, papers be referred to particular Members for their report thereon.

Professor Royle suggested that specimens of the species of Lichen used in India for the purpose of dyeing (one of which is extensively employed in the Northern provinces, and is there called Chulcheleera), be obtained, and sent to Mr. Visger for the purpose of being submitted to experiment.

Resolved,—That the Committee take measures to obtain specimens of those Lichens; and that they be sent to Mr. Visger for experiment.

An offer was made by Professor Royle, to furnish a list of all the plants of India which yield oil.

A similar offer was made by Colonel Sykes, with reference to the plants of the Dekkan which are suitable to the purposes of domestic economy.

Professor Royle also promised to prepare a paper on the subject of Caoutchouc, and to submit it to the Committee, at as early a period as his present numerous avocations would permit.

Resolved,—That the Committee will be happy to avail themselves of the kind offers of Professor Royle and Colonel Sykes.

Resolved,—That J. G. Malcolmson, Esq., be nominated a Member of the Committee.

Resolved,—That letters be addressed to the Horticultural and Agricultural Societies of India and of England, expressive of the wish of this Committee, to enter into communications with them on all subjects of mutual interest to the respective institutions.

List which accompanied Mr. Visger's Specimens of Lichens, &c.

" *Lichens of Commerce.*

No. of Specimen.	Commercial Name.	Botanical Name.	Value per Ton.
1.	Canary Orchilla Weed	Lichen Rocella..	250*l.* to 350*l.*
2.	Cape de Verde ditto....	——	200 to 300
3.	Western Island ditto....	——	150 to 230
4.	Madeira ditto..........	——	100 to 150
5.	African ditto..........	——	80 to 120
6.	South American ditto..	——	80 to 120
7.	Sardinian ditto.........	——	30 to 45
8.	Cape of Good Hope do..	——	20
9.	English ditto..........	——	No commercial value
10.	Canary Rock Moss....	Unknown....	80 to 90
11.	Sardinian ditto......	(supposed) Pustulatus	70 to 90
12.	Pustulatus ditto, of Sweden, Norway, and England....	Lichen Pustulatus, or Gyrophera..	20 to 40
13.	Tartarous Moss......	Lichen Tartarus..	20 to 40

" *Lichens liable to be mistaken for those of Commerce, but possessing no value.*

No of Specimen.	May be mistaken for	Points of Difference.
21.	Nos. 1 to 9.	The bad is flat, and has a bitterish taste; the good is cylindrical, and not bitter.
22.	No. 12.	The difference is apparent, but the Villous is generally more or less mixed with the Pustulatus whenever collected.
23.	No. 10.	The great similarity between the good and bad Canary Mosses, renders, the collection of the good a matter of some difficulty.

" *The Good* has a nearly white powder on its surface, towards the

centre; the under surface is of a gray colour, and is not hairy; if wetted it does not turn of an orange colour; its edges are flat and thin.

"*The Bad* has no mealy white powder on its surface; its under side is hairy, and blacker than the good; its edges are usually more or less knobbed, and on being wetted it generally becomes of an orange colour.

"No. 24, contains a mixed sample of good and bad, which has been wetted with water.

"The useless Mosses greatly outnumber the useful, and vary from each other, in some instances, by such slight shades of difference, that the above specimens of them can serve little more than to call minute attention to the subject. A *test* for the discovery of colour is therefore necessary.

"*Test.*—Take liquor ammoniæ, very much diluted with water, but strong enough to retain a powerfully-pungent smell—half-fill a phial bottle with the same, then add of the Lichen (being broken up to a convenient size), so much as will lightly fill up the liquor, so that the whole may be readily stirred about. Care must be taken to leave at least one-third of the bottle for air. The bottle must be kept corked, but be frequently opened, and the contents stirred with a small stick. The colour will begin to exhibit itself in a few hours, and the more rapidly in proportion to the warmth of the place in which it is kept; but the heat should not exceed 130° Farenh. A piece of white silk placed near the surface of the fluid will show the colour before it would otherwise be perceptible. This test will only serve to show where colour exists, but will not develop it to its fullest extent.

"*Localities.*—The good sorts are generally found in rocky or stony districts, or where dry stone walls abound; in the neighbourhood of the sea,—or if distant from the sea, in places exposed to sea breezes. The more valuable are met with in volcanic islands. My own experience has been principally in the Canaries, where I find the more arid the situation, the better the quality of the Lichens. When the land is high and humid, the useless sorts alone are met with. In dry places near the sea, there are only the good sorts;—and there is generally a belt between the two, in which both good and bad are found on the same stones, and not unfrequently overrunning each other.

"There is with the samples a small bottle of ammoniacal liquor, of

the strength suited for test; and also a small bottle of the colour to be produced."*

Mr. Southey's Communication.

"*London*, 24*th Nov.* 1836.

"We have much pleasure in offering you the following observations on the Wool imported into this country from Bombay, by which you will perceive there is in India a race of sheep which produces Wool that can be applied to useful purposes in some of our manufacturing districts; at the same time it will be seen that, with due attention to the assortment of the Wool, and to the improvement of the breed of sheep, a more valuable description of Wool may be produced.

"Most of the Wool which has hitherto been imported into this country from India, has been found of a short staple, with a vast quantity of hairs interspersed through the Wool (what is technically called kemp hairs): they will not receive dye, which renders such Wool unfit for general use, and consequently confines its application to the more ordinary branches of manufacture, such as blankets, and other low quality of goods.

"It evidently appears there are various descriptions of Wool produced in India, as we have seen some of a superior quality, which we are given to understand was produced in the province of Guzerat, some of which we estimate to be worth 15*d.* to 18*d.* per lb.

"The whole of the Wool hitherto imported from thence, came from the island of Bombay, we are therefore unable to form an opinion where the Wool is grown; but should the information we have obtained prove correct (that it is produced in Guzerat, and that that por-

* The Government of Madras, to whom the samples and test were sent by the *Royal Asiatic Society*, has forwarded them to the Literary Society, in whose Apartments they may be seen by any one desirous of inspecting them. Dr. Wight has made drawings of the lichens which have been transferred to stone, for the purpose of preparing representations, to make them better known. These will either appear in a future Number of this Journal, or be circulated over India, to aid the views of the Committee of Agriculture and Commerce of the Royal Asiatic Society.—Editor *Madras Journal.*

tion of the province is under British sway), it may be deserving consideration, whether an improvement in the quality of the Wool would not prove an advantage to this country.

"Under this assumption, we shall proceed to make the following observations:—

"During last year, there was imported into London 773 bags of Indian Wool, and into Liverpool 624.

"1397 bags—these were sold at public auction, at $4\frac{1}{4}d.$ to $14\frac{1}{2}d.$ per lb. They were chiefly white, and well washed: there is occasionally found a few black locks interspersed through the bags, which ought to be carefully excluded, as the Indian sheep's Wool is generally applied to the manufacture of white goods, consequently any admixture of coloured Wool tends to deteriorate its value.

"We have discovered amongst the finer qualities of Indian Wool, a considerable portion of yellow and discoloured locks, which operates very materially against its sale. In order to remove such an objection, it is requisite the discoloured wool should be selected from the white, and each kind packed in separate bags, by which means an increased competition for the article would be produced; at the same time its value would be thereby enhanced. To which we may further add, the Wool would be bought with greater avidity, as it could then be immediately applied to the various purposes of manufacture without further trouble or expense.

"To those who may feel the laudable desire of producing an improvement in the breed of sheep, and quality of their Wool, we would recommend the introduction of some of our best-woolled English rams amongst the Indian ewe flocks, as by so doing, the quality of the Wool would be materially improved, inasmuch as it would thereby become both a better and more useful class of Wool; at the same time the quantity would also be considerably augmented.

"We remain, Gentlemen, &c."

APPENDIX.

Madras, 15*th October*, 1837.

Sir,—I have now much pleasure in sending you a specimen of the work spoken of at page 74 of the last Number of the Journal. The plant figured is a new species of the natural order *Asclepiadæ*, nearly the whole impression of which has been struck off from my own press. I may here observe that I am well aware of my present imperfections in the difficult art of Lithography, but, as every successive trial exhibits some improvement on the preceding one, I am encouraged to anticipate ample success, when some further practice has conferred skill in the management of the press and in the performance of the various manipulations to be gone through in the process of printing from stone, and trust that my first number will afford satisfactory evidence of the style in which the work will be finished; thinking, at the same time, that the specimen now put forth may be looked upon, all things considered, as an earnest that the work itself will be found an useful aid to Indian botanists and by no means discreditable to the state of the arts in India.

Emboldened by this early success, it is with no ordinary feelings of satisfaction, that I contemplate the prospect which it holds out, of enabling me to carry into effect a design which ten years ago I was preparing to enter upon, the publication, namely, of a series of figures of Indian plants, under the title of *Illustrations of Indian Botany*: success being rendered more certain by the advantages derivable from my present official situation, as the work may be looked upon as part of the duties of my office; and, in this light, has received the sanction and approbation of the Madras Government.

These Illustrations have been undertaken in the hope of effectually aiding the advancement of botanical science among us, and thereby extending our acquaintance with numerous curious and useful plants, the value of which is known to few, or the knowledge is confined to particular districts, though the plants themselves may be widely distributed; and in the not less cheering expectation of permanently bringing to light, under systematic denominations,

many others endowed with the most valuable medicinal properties, of which I have received, from really competent observers, accounts so satisfactory, that they could not fail to produce a strong feeling of regret, that the narrators were unqualified to give me more perfect information regarding them. Specimens of such, gathered when in flower, and dried between the leaves of a book, or a few sheets of paper, in the manner detailed in a former communication,* might easily be transmitted from any part of India, if packed between the boards of an old book, or in stiff paper, and prove of the greatest value, especially if accompanied with notes detailing their uses, and mode of preparation; and as, in the composition of these notes, no scientific knowledge is required, I trust I shall be favoured with many such communications.

Botany has hitherto spread with tardy steps among us, the catalogue of Indian botanists having never, at any one time, comprised more than a few names: her most palmy days having undoubtedly embraced the concluding years of the last, and first quarter of the present century; during which, Koenig, Roxburgh, Rottler, Klein, Heyne and Buchanan Hamilton flourished.

When we contemplate the impediments which these truly great men had to surmount in arriving at the eminence they justly attained in their favourite pursuit, partly originating in the imperfection of books treating of Indian plants, and partly from the engrossing duties they had to perform, the intervals of which, only, they could devote to botany, we cannot too much admire their perseverance and devotion to science; while they afford a striking example of how much may be done by a skilful division of our time, and a careful appropriation of our leisure to scientific pursuits.

While we thus admire their industry in obtaining knowledge, we equally regret that, with the exception of the illustrious Roxburgh, leisure sufficient was not granted to any one of them to leave a comprehensive written record of the extent of his acquirements, for the benefit of succeeding labourers in the same field: hence, we are constrained to acquire much of our knowledge of Indian plants, in the same roundabout way that they did, that is, from general systems of Botany (greatly enriched by them, certainly), in place of local Floras.

These systems, embracing as they do the vegetation of the whole globe, are necessarily very concise, and the species so briefly described, as not seldom to render it next to impossible to identify the plant from its specific character. One object of the present work is to remedy, in

* See No. 15, p. 429.

some degree, this defect, which even the most carefully drawn characters, cannot always avoid, owing to the inadequacy of language to find terms sufficiently precise for the designation of the innumerable forms which the vegetable kingdom presents, and especially for distinguishing the varying forms which the same plant, when produced under circumstances tending to increase or diminish its luxuriance, is apt to exhibit.

The insufficiency of language alone, to convey just ideas of the forms of natural objects, has led naturalists, ever since the invention of engraving, to have recourse to pictorial delineation, to assist the mind through the medium of the senses; and, prior to the time of Linnæus, not without good cause, since nothing could be more vague than the language then employed in description. Impelled by this cause, the number of figures some of the older writers published, is truly astonishing. The precision of modern scientific language, the generalization of the innumerable objects of natural history into classes, orders, tribes, and families, and the accuracy and minute details which the representations of recent artists present, have fortunately all combined to diminish the necessity for the innumerable figures of the older naturalists, the latter cause having increased their cost so greatly, as materially to diminish their production, even to the extent required for the elucidation of the rapid advances natural history is now making.

The vegetable treasures of India have undoubtedly been highly honoured by the magnificence of the works dedicated to their illustration, as those of Rheede, Roxburgh, and Wallich, amply testify; but, unhappily for science, the first is very rare, and they are all so costly, that few can afford to purchase them, while, from their size, they can only be conveniently consulted in the library. In spite, however, of these drawbacks to their more general use, they have been of immense service to Indian Botany, and are alike honourable to their authors and to the countries which produced them, while the value of the last is vastly enhanced, by several very admirable memoirs on different natural orders by some of the most distinguished living botanists.

The work which I am preparing to enter upon, is of a humbler, but I hope not less useful, description; its object being to furnish, at the cheapest possible rate, a series of accurate figures of plants, with copious analysis of the parts of fructification, so as, in the words of a highly talented correspondent (the author of the tabular view of the generic characters of Roxburgh's Flora Indica), to supply the Indian botanical amateur with the 'one thing needful' towards acquiring a correct knowledge of the principles of the natural method of classification, by presenting him with a series of diagrams, if I may so call

them, which he can compare, point by point, with the written characters of the natural orders, selecting for illustration, as often as circumstances will permit, such plants as are valued on account of their useful properties.

In inviting public support to an undertaking of a kind so novel in Madras, it is necessary to give some information regarding the plan and cost of the work, though neither can as yet be said to be definitively determined upon. Several plans have suggested themselves, but the following seems to merit the preference.

The quarto size will be adopted, as affording more room for analysis and freer scope to the artist in making the drawings, a very considerable number of which are already prepared. The figures are to be coloured, and on each, in addition to the name of the order and plant figured, it is proposed to write the *Tamul* and *Teloogoo* and occasionally other names, in both native and Roman characters; and, lastly, each plate, in addition to its own number, will have the general number of the species in my Prodromus, if the plant is already described there, to facilitate reference, and after arrangement, should that become necessary. The letter press, in place of (as usual in such works) consisting of simple descriptions of the plants figured, and which can be little else than repetitions of the characters already published in the Flora, will, in the hope of rendering this portion of the work more generally useful and agreeable to both the botanical and general reader, be devoted to remarks illustrative of structural peculiarities; the valuable properties which predominate, either in the individual figured, or in the order to which it belongs; the methods adopted for procuring these, and peculiarities of culture, where such are required in their production.

In extent, it is not expected to exceed three hundred plates (but may possibly fall short of that number), to be published at the rate of about one hundred annually, in numbers, commencing in January 1838, or so soon as the names of one hundred subscribers are received; and continued, either monthly or every alternate month, as may be found most generally convenient and economical. The estimated cost to subscribers will not exceed thirty rupees, per volume of one hundred plates; one half of which is the cost of colouring alone, the remainder being charged for the letter press (which will be copious), lithography, paper, drawing, &c., and at this price it is nearly fifty per cent. under the English price of similar works.

This low price is effected by charging little more than the actual cost; it forming no part of my plan to reap personal profit from a work, the conducting of which I look upon as part of my present official duties. But, as it cannot expected that I should be a loser

BRITISH MUSEUM
NATURAL HISTORY.

...ungia del.   *Boucerosia pauciflora.*

by my public engagements, I think it necessary to add that prompt payment is indispensable to the continuance of the publication; as it is quite impossible for me to carry on so costly a periodical from my own very limited resources, and on these alone it must mainly depend in the outset. In England, authors of such works are differently situated. There, they contract with a publisher, possessed of the means of continuing the publication until the probability of remuneration is ascertained; but he, to remunerate himself for the risk and sacrifice of capital at the outset, charges a profit of from 30 to 40 per cent. on the cost, while he enjoys every facility which former experience, and the advanced state of the arts in Europe, give, to ensure the work being got up in the best style and at the lowest charge. In Madras the case is totally different: this is the first publication of the kind ever attempted here; we are, therefore, without experience, have no practised publishers, no colourists, find it even very difficult to get colours, and must depend on the chance of the market for our supplies of paper, in place of ordering it direct from the maker, of whatever size, quality and price might appear most suitable; here, in short, every thing must be done for the first time. I mention these incidental sources of disappointment in anticipation, lest imperfections should occur at the outset which might be unavoidable in Madras, but which, in more favourable circumstances, would justly merit censure.

In conclusion, a few words are required to make known the accompanying figure. The genus *Boucerosia* was first established in my Contributions to the Botany of India, and then consisted of two species only, *B. umbellata* and *B. crenulata;* both of these are at once distinguished from the present, by having their flowering branches terminated with a many flowered umbel, of rather long pedicelled flowers, whereas in this they are solitary, or few, and short pedicelled; thus forming a second section in the genus, which may now stand thus :—

§ I. Floribus umbellatis
Umbellis multifloris.
B. umbellata corollæ segmentis glabris.
B. crenulata corollæ segmentis longe fimbriatis.

§ II. Floribus subsolitariis.
B. pauciflora corollæ segmentis ciliatis.

To ROBERT COLE, ESQ.
Editor to the Madras Jour. of Lit. and Science.

Yours very faithfully,
ROBERT WIGHT.

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF JULY 1837.

Days.	Barometer at				Thermometer at				Rain.		Evaporation.	Direction of Wind.				Weather.			
	4 A. M.	10 A. M.	4 P. M.	10 P. M.	4 A. M.	10 A. M.	4 P. M.	10 P. M.	Sun rise.	Sun set.		4 A. M.	10 A. M.	4 P. M.	10 P. M.	4 A. M.	10 A. M.	4 P. M.	10 P. M.
1837	Inch.	Inch.	Inch.	Inch.	°	°	°	°	In.	In.	In.								
July 1	29,832	29,906	29,792	29,850	82,3	85,8	90,3	86,0	0,097	... ...	... ...	s w	w	n w	s w	Cloudy	Haze	Cloudy	Cloudy, lightning.
2	,800	,866	,760	,802	84,8	86,4	91,0	85,0	... ...	... ...	... ...	w	w	w	swbyw	Cloudy	Cloudy	Cloudy	Cloudy do.
3	,756	,816	,730	,800	84,6	86,0	90,0	87,0	... ...	... ...	... ...	s w	s w	w	s w	Cloudy	Cloudy	Fl. cl.	Clear do.
4	,778	,854	,754	,844	84,5	86,3	90,0	86,4	... ...	... ...	... ...	s w	swbyw	s s w	Calm	Clear	Clear	Cloudy	Cloudy do.
5	—	,882	,756	,884	—	85,9	91,0	84,2	0,107	... ...	3,708		w	s e	s w		Th. haze	Fl. cl.	Rain do.
6	—	,908	,792	,800	—	86,9	90,0	82,4	... ...	... ...	... ...		s w	s s e	s		Th. haze	Cloudy	Cloudy do.
7	—	,900	,792	,884	—	87,5	88,2	83,5	... ...	... ...	... ...		w	s s e	Calm		Clear	Cloudy	Cloudy do.
8	—	,910	,804	,874	—	86,3	88,0	85,0	0,108	... ...	... ...		s w	s s e	s		Haze	Fl. cl.	Fl. cl. do.
9	—	,874	—	,832	—	87,0	—	84,3	... ...	... ...	... ...		s w	—	s		Clear	—	Fl. cl. do.
10	—	,900	29,802	—	—	87,4	89,8	—	... ...	... ...	... ...		w	s e	—		Clear	Fl. cl.	— do.
11	—	,912	,772	29,838	—	87,6	88,2	84,2	... ...	... ...	... ...		w	s s e	s		Haze	Fl. cl.	Clear do.
12	—	,860	—	—	—	87,9	—	—	... ...	... ...	3,951		w n w	—	—		Clear	—	— do.
13	—	,860	29,755	29,832	—	86,3	92,0	84,4	0,259	... ...	... ...		swbyw	s w	s		Haze	Haze	Clear do.
14	—	,898	,750	,910	—	86,0	89,5	84,9	... ...	... ...	... ...		n w	s e	s s w		Haze	Haze	Clear do.
15	—	,952	,864	,936	—	86,8	88,0	84,4	... ...	... ...	... ...		w	s e	s		Haze	Th. haze	Clear do.
16	—	,928	—	,864	—	87,5	—	84,1	... ...	... ...	... ...		s w	—	s		Clear	—	Haze do. [ltg. &rain.
17	—	,856	29,752	—	—	86,8	88,0	—	... ...	... ...	... ...		s w	s s e	—		Clear	Fl. cl.	Brisk squall A. M. thr.
18	—	,916	,840	29,928	—	83,3	87,0	83,8	0,185	... ...	... ...		swbyw	s	s		Haze	Th. haze	Clear, lightning.
19	—	,952	,860	,914	—	86,3	90,0	84,2	... ...	... ...	3,652		w	e n e	s		Clear	Clear	Clear do.
20	—	,904	,816	—	—	86,4	88,0	—	... ...	... ...	... ...		n w	e s e	—		Clear	Haze	— do.
21	—	,870	,864	—	—	86,1	85,5	—	... ...	1,274	... ...		n w	w	—		Haze	Cloudy	— do. thunder.
22	—	,920	,854	—	—	80,7	83,5	—	... ...	0,427	... ...		s w	swbys	—		Cloudy	Cloudy	— do. do.
23	—	,922	—	29,902	—	82,8	—	82,6	... ...	... ...	... ...		w	—	s		Haze	—	Cloudy do.
24	—	,906	29,814	,876	—	82,4	86,5	82,3	0,097	... ...	... ...		s w	s w	s		Cloudy	Th. haze	Cloudy do.
25	—	,886	,802	,850	—	82,4	84,5	84,0	... ...	... ...	... ...		s w	n w	s		Th. haze	Cloudy	Haze do.
26	—	,866	,768	,828	—	84,2	87,7	85,0	... ...	... ...	2,832		s w	w s w	s		Th. haze	Cloudy	Th. do. do.
27	—	,868	,756	,852	—	84,7	90,0	87,2	... ...	... ...	... ...		s s w	w s w	s w		Haze	Cloudy	Haze do.
28	—	,884	,772	—	—	86,4	91,7	—	... ...	... ...	... ...		swbyw	w s w	—		Clear	Fl. cl.	— do.
29	—	,916	,788	29,850	—	87,2	91,0	85,4	... ...	... ...	... ...		s w	e s e	s w		Clear	Fl. cl.	— do. thunder.
30	—	,896	,808	—	—	85,9	87,7	—	0,100	... ...	... ...		s w	s e	—		Clear	Fl. cl.	— do. do.
31	—	,880	,802	29,898	—	87,2	88,0	84,8	... ...	... ...	... ...		s w	e s e	s		Clear	Fl. cl.	Th. hz. do.
Mean	29,792	29,893	29,793	29,863	84,0	85,8	88,7	84,6	... ...	... ...	... ...								

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF AUGUST 1837.

Days.	Barometer at 4 A. M.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Thermometer at 4 A. M.	Thermometer at 10 A. M.	Thermometer at 4 P. M.	Thermometer at 10 P. M.	Rain. Sun rise.	Rain. Sun set.	Evaporation.	Direction of Wind. 4 A. M.	Direction of Wind. 10 A. M.	Direction of Wind. 4 P. M.	Direction of Wind. 10 P. M.	Weather. 4 A. M.	Weather. 10 A. M.	Weather. 4 P. M.	Weather. 10 P. M.
1837	Inch.	Inch.	Inch.	Inch.	°	°	°	°	In.	In.	In.								
Aug. 1	—	29,908	29,804	29,894	—	86,4	85,0	83,8	... ...	0,494	... ...		S W	S E	S		Haze	Cloudy	Cloudy th. litng.
2	—	,928	,816	,890	—	84,5	88,0	83,7	0,32?	... ...	3,662		S W	S	S W		Clear	Fl. cl.	Clear lightning.
3	—	,956	,846	,880	—	84,4	88,0	85,0	0,117	... ...	... ...		W	W N W	S		Haze	Th. haze	Haze do.
4	—	,912	,832	,912	—	82,4	89,0	84,2	0,037	... ...	... ...		S W	W N W	S		Cloudy	Th. haze	Cloudy do.
5	—	,900	,826	,924	—	85,3	85,5	84,4	... ...	... ...	... ...		W	N W	S		Haze	Drizzling	Cloudy do.
6	—	,924	,852	,922	—	84,8	87,8	84,0	... ...	... ...	... ...		N W by W	E S E	S		Cloudy	Th. haze	Clear do.
7	—	,924	,852	,924	—	86,5	86,4	84,4	... ...	... ...	... ...		N W	S S E	S		Haze	Th. haze	Clear th. litng.
8	—	,946	,824	,916	—	86,3	88,2	85,3	... ...	... ...	... ...		S W	S E	S W		Clear	Clear	Cloudy do.
9	—	,936	,828	,910	—	85,4	88,2	84,5	... ...	... ...	2,745		W	E S E	S		Clear	Clear	Fl. cl. do.
10	—	,916	,808	,904	—	86,3	88,5	86,0	... ...	... ...	... ...		S E	S S E	S		Clear	Clear	Haze lightning.
11	—	,908	,810	,924	—	85,8	86,5	85,5	... ...	... ...	... ...		N W	S E	S E		Clear	Th. haze	Fl. cl. do.
12	—	,928	,836	,900	—	87,3	87,5	84,4	... ...	... ...	... ...		N W	W	S		Th. haze	Cloudy	Clear th. litng
13	—	,902	,800	,884	—	86,5	88,5	85,0	... ...	... ...	... ...		N	E	S S W		Clear	Clear	Cloudy do.
14	—	,876	,826	,900	—	85 8	89,5	84,0	... ...	... ...	... ...		S W	E	S		Haze	Cloudy	Cloudy do.
15	—	,864	,796	,874	—	80,2	85,6	84,0	0,300	... ...	... ...		N W	W	S W		Cloudy	Cloudy	Cloudy do.
16	—	,890	—	,884	—	83,4	—	83,8	0,100	... ...	3,171		W	—	S W		Cloudy		Cloudy do.
17	—	,894	29,832	—	—	81,9	83,0	—	... ...	... ...	... ...		W	W	—		Cloudy	Cloudy	— do.
18	—	,872	,788	29,854	—	81,3	84,4	82,9	... ...	... ...	... ...		W	N W	N W		Cloudy	Cloudy	Cloudy do.
19	—	,854	,742	,873	—	81,8	84,3	—	... ...	... ...	... ...		W	N W	N W		Cloudy	Cloudy	— do.
20	—	,845	,732	,866	—	82,0	88,0	85,6	0,287	... ...	... ...		W	S W	S W		Fl. cl.	Fl. cl.	Cloudy do.
21	29,844	,914	,802	—	82,2	84,3	89,0	—	... ...	... ...	... ...	S W	S W by W	S W	—	Clear	Haze	Fl. cl,	— do.
22	,870	,926	,802	29,894	82,2	85,4	89,7	86,8	0,027	... ...	... ...	S W	S W by W	W N W	S W	Haze	Clear	Fl. cl.	Cloudy do.
23	—	,910	,792	,890	—	86,3	90,0	88,0	... ...	... ...	2,692		W	W S W	S W		Haze	Cloudy	Cloudy do.
24	—	,916	,792	,890	—	88,2	91,0	88,0	... ...	... ...	... ...		W	W S W	W		Haze	Cloudy	Haze do.
25	—	,918	,782	,882	—	87,8	90,0	87,8	... ...	... ...	... ...		W	W S W	S W		Haze	Cloudy	Cloudy do.
26	—	,908	,784	—	—	86,5	88,4	—	... ...	... ...	... ...		W	S W	—		Cloudy	Cloudy	— do.
27	—	,870	—	29,842	—	87,5	—	85,9	... ...	... ...	... ...		S W	—	S		Cloudy		Clear do.
28	—	,874	29,764	,854	—	87,7	92,0	84,8	... ...	... ...	... ...		W	S W	S		Clear	Fl. cl.	Clear do.
29	—	,920	,816	,930	—	87,4	92,0	84,5	... ...	... ...	... ...		S W	W S W	S		Clear	Clear	Clear —
30	—	,982	,852	,970	—	87,8	89,0	85,5	... ...	... ...	3,140		S W by W	S S E	S E		Th. haze	Fl. cl,	Cloudy th. litng.
31	—	,976	,824	,920	—	87,3	89,5	86,5	... ...	... ...	... ...		W N W	E S E	S S E		Clear	Cloudy	Cloudy do.
Mean	29,857	29,910	29,809	29,897	82,2	85,3	88,0	85,1											

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF SEPTEMBER 1837.

Days.	Barometer at 4 A. M.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Thermometer at 4 A. M.	Thermometer at 10 A. M.	Thermometer at 4 P. M.	Thermometer at 10 P. M.	Rain. Sun rise.	Rain. Sun set.	Evaporation.	Direction of Wind. 4 A. M.	Direction of Wind. 10 A. M.	Direction of Wind. 4 P. M.	Direction of Wind. 10 P. M.	Weather. 4 A. M.	Weather. 10 A. M.	Weather. 4 P. M.	Weather. 10 P. M.
1837	Inch.	Inch.	Inch.	Inch.	°	°	°	°	In.	In.	In.								
Sep. 1	—	29,900	29,804	29,854	—	87,4	89,7	87,3	... ...	... ...	... ...		W	S E	S		Cloudy	Cloudy	Cloudy lightning.
2	—	,908	,812	,893	—	86,6	91,0	85,2	... ...	... ...	... ...		swbyw	S W	S E		Haze	Th. haze	Rainy do.
3	—	,981	,852	,950	—	86,2	89,0	86,2	0,075	... ...	... ...		W	S W	S		Th. haze	Th. haze	Haze do.
4	—	,968	,826	—	—	87,0	91,5	—	... ...	... ...	... ...		S W	S W	—		Clear	Cloudy	—
5	—	,926	,812	29,944	—	86,4	90,0	87,1	0,027	... ...	... ...		N W	E S E	W N W		Th. haze	Cloudy	Cloudy do.
6	—	,926	,808	,894	—	85,3	91,5	85,6	[illegible],05	... ...	3,265		Nwbyw	W S W	S E		Th. haze	Cloudy	Cloudy do.
7	—	,934	—	,890	—	86,3	—	84,2	0,127	0,248	... ...		W	—	S W		Th. haze	—	Cloudy do.
8	—	,928	—	,916	—	85,7	—	84,1	......	... ...	... ...		S W	—	S		Th. haze	—	Cloudy do. & th.
9	—	,920	29,802	,886	—	83,9	90,0	82,8	0,652	... ...	... ...		W	N W	S		Cloudy	Fl. cl.	Fl. cl. do.
10	—	—	,806	,896	—	—	87,0	84,4	... ...	... ...	... ...		—	S S E	S		—	Cloudy	Cloudy do.
11	—	29,920	,824	,928	—	85,2	88,0	85,9	... ...	... ...	... ...		S S W	S S E	S		Clear	Clear	Cloudy do.
12	—	,950	,852	,940	—	85,8	88,0	84,2	... ...	... ...	... ...		W	S S E	S W		Clear	Clear	Fl. cl. do.
13	—	,99[illegible]	,884	,978	—	86,2	88,0	83,8	... ...	... ...	3,578		S W	S E	S E		Clear	Clear	Clear do.
14	—	30,030	,882	,972	—	85,8	87,4	82,3	0,412	... ...	... ...		S W	S S E	S		Fl. cl.	Clear	Clear do.
15	—	,030	,880	,990	—	85,0	87,0	82,5	... ...	... ...	... ...		S W	S S E	S		Fl. cl.	Clear	Fl. cl. —
16	—	,028	,890	,956	—	84,4	86,0	82,3	... ...	... ...	... ...		S E	S S E	S		Fl. cl.	Clear	Clear
17	—	29,980	,882	,976	—	85,0	86,0	82,2	... ...	... ...	... ...		S E	S E	S		Fl. cl.	Clear	Clear lightning.
18	—	30,000	—	,984	—	84,6	—	82,9	... ...	... ...	... ...		S W	—	S		Fl. cl.	—	Clear do.
19	29,940	,028	29,880	—	79,9	85,2	87,0	—	... ...	... ...	... ...	N W	S	S E	—	Fl. cl.	Fl. cl.	Clear	— do.
20	29,920	29,992	,866	29,970	80,0	83,5	86,4	83,2	... ...	... ...	3,203	S W	E	S E	S E	Fl. cl.	Fl. cl.	Clear	Clear do.
21	—	30,006	,882	,980	—	84,2	86,0	83,7	... ...	... ...	... ...		S E	S E	S		Fl. cl.	Clear	Clear do.
22	—	,030	,924	30,012	—	84,7	87,0	82,6	... ...	... ...	... ...		S E	S E	S E		Fl. cl.	Fl. cl.	Clear do.
23	—	,032	,920	29,998	—	85,8	87,0	83,9	... ...	... ...	... ...		E	E S E	S		Fl. cl.	Clear	Clear do.
24	—	,020	—	,980	—	85,2	—	84,0	0,100	... ...	... ...		E	—	S		Fl. cl.	—	Clear do.
25	—	,[illegible]00	29,880	,960	—	85,8	85,6	83,8	... ...	... ...	... ...		S E	S E	S E		Fl. cl.	Cloudy	Clear do.
26	29,912	29,982	,856	,964	82,0	86,2	87,5	84,3	... ...	... ...	... ...	S E	S W	E	S E	Clear	Fl. cl.	Haze	Clear do.
27	—	30,018	,900	30,010	—	86,4	88,0	84,3	... ...	... ...	2,912		S Ebys	E S E	S E		Fl. cl.	Clear	Clear do.
28	—	,016	,904	—	—	86,3	87,5	—	... ...	... ...	... ...		E	E S E	—		Fl. cl.	Th. haze	— do.
29	—	29,976	,908	—	—	84,6	85,0	—	... ...	0,287	... ...		N E	E S E	—		Cloudy	Cloudy	— do.
30	—	,972	,890	29,944	—	82,9	83,0	82,5	... ...	1,864	... ...		W	E	S E		Rain.	Th. haze	Cloudy do. heavy dew.
Mean	29,924	29,979	29,863	29,949	80,6	85,4	87,7	84,0											